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UNITED STATES NAVAL INSTITUTE PROCEEDINGS.

Vol. 35, No. 4. DECEMBER, 1909. Whole No. 132.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

HOW SHALL WE INDUCE OUR MEN TO CONTINUE IN THE NAVY?

By CAPTAIN A. C. DILLINGHAM, U. S. Navy.

I believe it to be a fact conceded by all officers and others interested in the naval service that the efficiency of the fleet would be greatly increased if we had a larger continuous service force.

The pay and possibilities for the future offered by the Government are sufficient to allow the Navy Department to compete successfully with civil institutions in securing men, but, for some reason or another, these men do not continue in the service. To-day we find of the enlisted force about 76 per cent of the men on their first enlistment, about 16 per cent on the second enlistment, and only about 4 per cent on third enlistment, with the rest scattering. If such a condition is to continue our fleet will always be a training fleet, and though the results of cruising and target practice show a high state of efficiency, we are convinced that a higher percentage of efficiency can be attained by having a larger number of continuous service men.

The following table will exhibit the condition of the enlisted force in fleet to-day with respect to length of service:

	No. on board.	Enlistment.			4th and upwards	Gun-pointers who fired at previous practice.
		1st.	2d.	3d.		
Rhode Island.....	786	642	103	41		
Louisiana	840	694	92	32	22	31
Ohio	708	573	95	15	25	26
Kansas	853	696	100	14	43	79
Missouri	714	578	101	16	19	25
Georgia	809	716	66	15	12	51
Virginia	775	606	124	29	16	31
Wisconsin	620	510	82	17	11	42

It is reported that the continuous service force is increasing, that more men are now re-enlisting, but this increase is small, as is shown by the following official figures:

1905 (Entire Year).		
Total number of men in service.....	41,021	
Total continuous service men	4,897	
Percentage of continuous service men.....		11.9%
June 30, 1905.		
Number of men in service.....	30,804	
Continuous service men.....	4,897	15.9%
1908 (Entire Year).		
Total number of men in service.....	55,956	
Total continuous service men.....	7,456	13.3%
June 30, 1908.		
Number of men in service.....	39,048	
Continuous service men.....	7,456	19.1%

If any considerable number of men have re-enlisted since June, 1908, such re-enlistments have undoubtedly been influenced by the fact that there is a prospect of a twenty-five year retirement law being enacted.

Modern wars have been short; wars of the future promise to be shorter. There will be no time to train men during war. The fleet must be manned by trained men, if we are to compete successfully with a fleet manned by continuous service men. Admiral Beresford has said that, "You may take two years to build a battleship, but it takes six years to make a first-class seaman gunner." The Admiral is quite right, and does not make the estimate of time too long. The needs for a continuous service force, around which may revolve the comers and goers, seem to me to be obvious and need no argument, and if the United States Navy is to attain the highest state of efficiency and to *maintain* that standard, it must increase the number of continuous service men very considerably.

The great question in considering the enlisted personnel of the navy is—"How shall we induce men to remain in the service?"—and I submit that this question is second in importance to no other question affecting the efficiency of the fleet, and demands the serious consideration of the proper authorities.

The methods of manning our navy by voluntary enlistment, and the effect of our institutions upon the character of our men make it absolutely necessary that in any effort to create a larger continuous service force we must consider the demands of the enlisted men so far as is possible.

Serving in a military profession in a non-military country makes the conditions in our service very different from those that exist in a military country, where men may still serve the State in various capacities after retiring from actual service, and in our country, it would be quite impossible, for instance, to establish a twelve-year enlistment term as is done in England.

The question—"How shall we induce men to remain in the service?"—can best be answered after we find out why men do not re-enlist, and, to my mind, the source of this information is the men themselves.

At the St. Helena Station, where there has been assembled at one time as many as 3700 men, and where the commanding officer is always able to come in contact with a large number of general service men, there have been called meetings of all the men at the station who had been in the service one enlistment or more. The commanding officer presided at these meetings, but had no voice in the proceedings, other than to state the object of the meeting, which was to discuss the requirements of the service from the enlisted man's view point, and to submit specific subjects for discussion.

The results obtained at this meeting lead one to believe that the men of the service fully appreciate the efforts which are being made by the Navy Department and the Bureau of Navigation to improve the condition of the enlisted personnel; that the pay of the navy is sufficient, and satisfactory, though it might be better equalized; that the status of petty officers in the navy might be better established, by making petty officers of only the ratings which from a military view point should be petty officers; that the term of enlistment (four years) is best suited to the conditions in our country; that the food and messing facilities for the enlisted personnel are entirely satisfactory, and that the men are

generally very happy and contented, so long as they are in the service.

It seemed to be the general opinion of the men assembled at this meeting that the one great reason why men do not continue in the service is that, with our present retirement and pension laws, there is not a sufficient guarantee that, sometime in the future, these men will be able to realize their hopes of an independent home life, with a habitation that they can support as the result of their hard work and efforts in their country's service. The enlisted men of the navy realize that, with the strenuous conditions which must necessarily exist in a modern fleet, the average man may not survive in good physical condition the thirty-years service required by the present law, and further, the enlisted men of the navy find that, though they may serve three, four, five or six enlistments, and become incapacitated for the service by causes incident to the service, they cannot receive sufficient means to enable them to live properly after condemnation by medical survey.

In other words, our retirement and pension laws are not satisfactory. If we examine the retired list of the enlisted force we will find there are only about 240 men on that list, and that most of these men have had but very little sea service; they are men who have been employed in various capacities on shore.

The amount of a pension under the present laws is so small that it is insufficient to induce men to remain in the service after the second enlistment, and so run the risk of being physically incapacitated before the retirement age, or of remaining in the service long enough to make it impossible to renew or take up civil occupation.

With the strenuous life in a modern battle fleet, men do not survive the thirty-years service before retirement, or they leave the service while they are in good physical condition for civil employment. Men desirable for the United States Navy, men who think seriously of choosing a profession or occupation for life, thoughtful, intelligent men, will not accept the conditions, as a business risk, that are offered by the naval service in the matter of retirement and pension under the present laws.

With the first enlistment this is not so much a matter of consideration, but after the second enlistment a man finds himself with considerable money saved, and he begins to look at the future in a serious business way, as a matter of dollars and cents,

and he has before him two propositions—First: "I am in good physical condition, I have not been in the navy long enough to lose touch with relatives and friends on shore, I have learned a good trade in the navy, or I have improved in knowledge of my trade by my service in the navy, and the probabilities are that I can get good employment in civil life. I am thinking seriously of getting married, and of eventually having a habitation of my own, where I can enjoy a normal life. Shall I leave the service while I am still in good health, and have sufficient money to make a start in civil life?" or, Second: "Shall I remain in the service until I have lost touch with relatives and friends in civil life, and become too old to engage in any kind of business, and run the risk of being incapacitated before I have had sufficient service for retirement, by causes incident to a strenuous service, and then find myself with a pension too small for proper living?"

It is considered that the pension laws are just and proper in the cases of men without considerable length of service, say up to ten years, but that after a man has served ten years or more the amount of pension is insufficient for the amount of service rendered and the effects of that length of service in incapacitating a man for employment on shore.

Our retirement and pension laws are not operative in as much as we can get no results from them, and if these laws do not suit the conditions of the service in getting desired results, they should be repealed and other laws enacted which will meet the requirements of our service, and provide a means for increasing the continuous service force of the navy.

I propose the following draft of a bill which, if enacted, would in the opinion of the enlisted men, do away with several of the principal causes that prevent men from continuing in the service.

Be it Enacted, That when an enlisted man shall have served twenty-five years in the navy, he shall, upon application to the President, be placed on the retired list with seventy-five per centum of the pay he may then be in receipt of, and that he shall receive allowances as follows: nine dollars and fifty cents per month in lieu of rations and clothing, and six dollars and twenty-five cents per month in lieu of quarters, fuel and light. *Provided*, That in case the applicant has served twenty years in the engineering ratings of the navy, he shall be placed on the retired list, upon application to the President, as above provided with pay and allowances as set forth in section 2 of this Act.

SECTION 2. That when an enlisted man has served ten years in the navy, and less than twenty-five years, and has become incapacitated for further service through disease or injury incident to his service, he shall, upon

the recommendation of a board of survey consisting of three officers, one of whom shall be a medical officer, be placed on the retired list, with pay, to be determined by multiplying one thirty-second of the amount of pay he may then be receiving by the whole number of years' service the man may have, and that he shall receive allowances as those provided for in section 1 of this Act.

Section 3. That in computing the necessary service for retirement, all service in the army, navy and marine corps shall be credited.

Section 4. That where the pension for disability under pension laws heretofore in force would be greater than the aggregate of the pay and allowances provided for under this Act, nothing in this Act shall be construed to prevent a man eligible for the benefits of this Act from waiving said benefits and otherwise applying for a pension for his disability.

Section 5. That all Acts and parts of Acts. so far as they are in confliction with this Act, are hereby repealed.

In presenting argument for the enactment of this proposed bill, attention is invited to the fact that on November 30, 1908, the then Secretary of the Navy strongly approved the bill, H. R. 19,361; this bill was a straight retirement bill, retiring enlisted men after a total of twenty-five years' actual service. That the Navy Department approved such bill makes it require no further argument, but I quote the letter of approval referred to as it so fully sets forth the reasons why the retirement of enlisted men of the navy after twenty-five years of service is just and reasonable.

Navy Department, Washington, Dec. 30, 1908.

H. R. 19,361.—Providing for the Retirement of Petty Officers and Enlisted Men of the United States Navy.

Sir.—In reply to your letter of the 15th instant, requesting the views and recommendation of the department upon a bill (H. R. 19,361) "providing for the retirement of petty officers and enlisted men of the United States Navy," I have the honor to recommend that this bill be given favorable consideration.

Under existing laws it is possible for enlisted men of the army and marine corps to retire after fifteen years' actual service, time served in our insular possessions being credited as double time for purpose of retirement. In practice an enlisted man of the army or marine corps who has served but five years in our insular possessions would be entitled to retirement after a total of twenty-five years' actual service. On the other hand, enlisted men of the navy, although their duties constantly take them away from home and into climates injurious to their health, are now required to render thirty years' actual service before receiving the benefits of retirement.

Experience has shown that after twenty-five years' active service in the navy the average enlisted man, by reason of the stress of his duties, has terminated his usefulness to the service and must either be discharged with-

out provision or retained in the navy, when no longer capable, in order that he may obtain the benefits of the thirty-year retirement law.

It is believed that the enactment of the bill in question, providing for retirement after twenty-five years, will do much to encourage enlistments in the navy, as well as the re-enlistment therein of experienced men, resulting in increased efficiency of the enlisted personnel.

Very respectfully,

TRUMAN H. NEWBERRY, Secretary.

I believe it is an acknowledged fact that men of the engineer's force cannot stand the physical wear and tear for over twenty years, and though the proposed bill provides that a man of the engineer's force may retire voluntarily after twenty years' service, it will be noted that he does not get the same retirement pay that he would receive had he remained in the service the full twenty-five years, and the probabilities are that, unless a man is physically disqualified, he will not retire until after twenty-five years of service so that he may receive the maximum pay.

The following table exhibits the condition of the enlisted personnel of the navy with reference to continuous service in 1908:

First enlistment		29,734
Second	"	5,862
Third	"	1,642
Fourth	"	668
Fifth	"	446
Sixth	"	264
Seventh	"	184
Eighth	"	112
Ninth	"	30
Tenth	" and upwards	112
Total		39,048

It would appear from this that the most serious trouble is at the third enlistment, and that in order to correct this we should apply the inducements to remain in the service at the third enlistment, and for this reason the proposed bill provides for an allowance to men who have become physically disqualified by causes incident to the service who have had upwards of ten years' actual service, or in other words, to men in their third enlistment and upwards. It is most desirable to save to the service the 5862 men on their second enlistment.

As stated above, the Navy Department has approved a bill which would give three-fourths of a man's pay after twenty-five years' service, and in order that we may have some multiple, which will give a retired pay strictly proportionate to the length

of service we convert the three-quarters into twenty-four thirty-seconds, which gives an easy and equitable multiplier to determine how much a man should receive for service proportionately less than twenty-five years.

It is a very simple matter to find cases where men have been in the service 12, 14, 16 or 18 years, with creditable records, and having been physically disqualified for the service, are dropped from the service with a pension so small as to be entirely out of proportion to the length of service, and inadequate for support.

If it is conceded that a man should receive twenty-four thirty-seconds of his pay upon retirement after twenty-five years' service, it seems equitable that he should receive twenty thirty-seconds of his pay upon retirement after twenty years of creditable service, and so on down to ten years' of service, if this retirement is occasioned by physical disability incident to his service, which prevents him from remaining in the service and receiving the benefits allowed for twenty-five years' service.

With less than ten years' service, the present pension laws are considered adequate.

It is believed if such a bill could be enacted that it would do away with the principal causes which prevent men from continuing in the service. It would give to men a guarantee for a desirable future in the service, at a critical time in their service, when they are trying to decide whether they will remain in the service or not. It would encourage men to accept the third and fourth enlistment, and so be almost a sure guarantee for continuous service, for it is found that generally when a man accepts his third enlistment he will continue in the service as a permanent occupation.

There is no doubt but that the climax of our profession is to be able to hit the target the greatest number of times in the shortest possible time, and we are certainly devoting most, if not all of our energies and thoughts to this one subject, but we are neglecting the one great element to permanent success in not making great efforts to secure a large continuous service force, which would allow gunnery efficiency to increase by having more or less permanent gun pointers, instead of having to create new gun pointers for each practice.

Every officer in the service is highly gratified with the increase of efficiency of gun practice, and appreciate the soundness of the methods of training at guns, but I am quite sure that it is the

opinion of a large number of officers of experience that we slight other most important matters which have to do with the general efficiency of the fleet in our eagerness to excell at target practice.

The navy to-day is better known throughout the country than ever before, and has become more of an institution in the land. Many young men enter the navy for a change and an opportunity to see something of the world, without an idea of how long they expect to remain, but there are a great many men who come into the navy hoping to find permanent employment, and a large percentage of our recruits to-day represent a very important and intelligent class of our citizens, and in dealing with them we are obliged to consider the American character, which compels our people to look at things in a more or less business way, and as a matter of dollars and cents.

The Government has created many institutions for the special training of men for the navy, and it must not be forgotten that this special training is also making our men very desirable for civil employment. This is particularly the case in the artificer branch and the special branch of the service, and the men of the seaman branch are very desirable for civil employment by reason of the discipline that they have lived under in the navy, which gives to them the habit of obedience without argument.

These are points which, in devising means for retaining men in the service, we must consider. There is no way of compelling men to remain in the United States Navy, it is a matter of choice with them, and if we want to retain their services, we must give them as good opportunities for enjoying a normal life as is given in civil life.

A systematic method of detail of the enlisted force might give the opportunity for successive sea and shore duty to men who have been for eight years or more in the service.

There are various places in connection with the naval establishment where men could be employed, profitably to the Government, and to the satisfaction of the enlisted men, such as recruiting stations, recruiting rendezvous, training stations, receiving ships, and all rendezvous for general service men, magazines, the gun factory, shops at torpedo stations, in the fleet of craft used at navy yards and stations, and at navy yards. At our navy yards there is no reason why the enlisted force of the navy should not be detailed as watchmen, ship-keepers, and in the manufacturing and general storekeeper's departments.

Until we can get the conditions of the service such that men may lead approximately normal lives, we are not going to get Americans to remain in the service. We do have home ports for ships, which will allow men attached to these ships an uncertain amount of time with their families, but there is no system of shore service for our men, no guarantee or system that will assure the enlisted men that they will not spend their entire naval careers afloat and at places remote from and absolutely inaccessible to their attachments on shore. In this respect, it would seem that a man having served two enlistments in the navy might have some reasonable guarantee for a fair amount of shore duty combined with sea service in his future enlistments.

There is no doubt that our men are enthusiastic in their competition for records, that they have the esprit so necessary in getting results, but it is quite as much a fact that men do get stale with a fleet policy that prevents cruising, where the man cannot have a change of scene, climate, people and routine. With all the hard work during the cruise of the fleet around the world, that cruise was most popular, and besides attracting many recruits to the service, it gave a new start for the men of the service and a relief from the monotony of the drill grounds and fleet routine.

With a fleet of twenty battleships, four divisions could always be in formation, while the fifth was making a cruise around the world.

I have quoted the opinion of the Naval Department upon the advisability of retiring enlisted men of the navy after twenty-five years of actual service—I have investigated the causes which keep men from continuing in our service, and present a means which might do away with these causes so detrimental to the service, but unless there is some authoritative head to father this important subject nothing will be done. Much has been written on this subject and many suggestions have been made, but unless the matter is taken up by the Navy Department nothing can be accomplished.

The question of how best to induce our men to continue in the service is of such great importance to the efficiency of the fleet that I believe it to be worthy of the earnest consideration of the General Board, or of a competent board ordered for that specific purpose.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE FLEET READY TO FIGHT.

A REPLY TO PAY INSPECTOR MUDD'S ARTICLE ON NAVAL RE-ORGANIZATION, IN THE MARCH PROCEEDINGS, 1909.

By LIEUT.-COMMANDER A. B. HOFF, U. S. Navy.

The Naval Institute has placed before the service, and hence opened up for discussion in its pages the question of naval re-organization, and more especially *the place* of the "commercial and industrial forces" (sic) in the naval establishment—that is, their relation to the fleet.

About seventy-five per cent of all officers in the navy have had less than ten years active service. They have consequently had little time for thought or study upon the principles governing in this important and absorbing subject.

The following attempt, therefore, may not be amiss, considering that a somewhat opposite (and I believe unsound) view, has been stated by Pay Inspector Mudd, with great cleverness and attractive detail.

His essay starts out:

> The aim in what follows is the placing of the industrial and commercial forces of the naval establishment in their proper place in any re-organization that may be undertaken; not in any relative place as to the strictly military forces, but in *their place*, and in doing this to save the whole of the naval establishment from going backwards. The writer wishes to prove that the place of these industrial and commercial forces can never be one of direct subordination to any force except that of the civilian Secretary of the Navy, in any organization that will survive the criticism of the patriotic economist.

The aim of the foregoing is obvious. The question, however, is, what is their proper place?

The essayist clearly states his position and reiterates it, so that

there is no possible doubt that his idea of naval organization is to place the Secretary of the Navy in the position of *co-ordinator* of (what the essayist claims are) the various *independent* elements in the naval establishment.

In this view he is clearly opposed to the majority of former secretaries of recent times, who, knowing that the navy exists for a sole military purpose (war), have asked Congress, time and again, to provide them with an authorized body whose *sole duty* it shall be to place before him the military aspect of all questions great enough and important enough to be considered by him.

Other aspects than military ones are of course plain to him.

And, be it noted, this request is not one asking for a body of officers to take over the duties of secretary, nor to consider questions other than those having a direct military consequence on the fleet ready to fight.

It is a request *as stated*.

The discussion of what organization can best assist the Secretary of the Navy in wielding the power, and assuming the responsibility, which is solely his, under the President, is a perfectly legitimate one.

Moreover, Pay Inspector Mudd's idea of independent specialties, and co-ordination by the Secretary alone, is not an affirmation of the principle that the Navy Department should have a civilian head. Such principle is equally the birthright of those that differ with him. It is our political faith as Americans no less than the clear teaching of professional experience.

No former Secretary renounced such principle when asking for military advice, and consequently, an exposition of what the writer believes to be the basic principles of naval organization do not in any way touch this point.

In contradiction, therefore, to Pay Inspector Mudd, I claim "that any question affecting the fleet, big enough and important enough to come up to the Secretary of the Navy, should pass through and be commented upon, by a body of military advisors, previous to its submission."

But to return specifically to the opening statement of the essay.

The industrial and commercial forces of the navy have an immediate and perfectly clear relation to the military force, *at all times*. That is the only reason they exist. There is no other reason. They are not independent parts of the naval establish-

ment. They exist solely for a military (naval) purpose. Therefore, they cannot exist except in relation to the military forces, and in a perfectly clear and consequent relation. They do not exist by reason of themselves; they exist solely for the fleet. Their place is, therefore, clearly defined.

It is the purpose of this essay to show where that place is.

To quote again:

> The industrial and commercial part of the naval establishment is the auxiliary of nothing, it is a main part (p. 38).

The essayist here undoubtedly wishes to express that the industrial and commercial parts of the naval establishment are independent parts, each one, of the many activities into which that branch of the government resolves itself.

Such is clear, not only from the context, but from his consequent statement that these forces should be coordinated by the Secretary of the Navy.

Now there is only *one* "main part" to the naval establishment, and that is the fleet. And there is only one reason for the fleet's existence and that is to fight. And there is no reason for the Navy Department's existence, and the whole naval establishment except to have the fleet ready to fight. "The fleet ready to fight" is the ultimate expression of the $1.50 each man, woman, and child in the United States pays yearly for peace insurance, which means permanency of the bread-winner's job.

With this plain fact as a starting point in our argument, it is clear that the naval establishment must be divided into two parts, or activities, those forces controlling the fleet, and those getting it ready to fight. All forces not controlling it are hence auxiliary to it.

The statement, therefore, that the industrial and commercial forces in the naval establishment are the auxiliary of *nothing*, is clearly beside the mark, because they would not exist were they not the auxiliary of *something*.

One way of showing the relations of the various forces in the naval establishment, both within itself and to the country at large, is by a diagram.

To return again to the essay—in the mind of the writer there seem to be three distinct claims made, each a direct consequence of the major proposition, with which Mr. Mudd's essay starts out.

These claims I take to be:

(1) Staff officers *are* the industrial and commercial forces of the naval establishment, and should, therefore, be in control on shore.

(2) They are *officially* co-equal with the military branch—the line.

(3) The line should not be officially dominant in the navy—(an organization existing for a purely military reason).

I here use the word "staff" in the somewhat unusual sense that it is applied to the navy in our statutes. Its application to a body of officers, that in the other English speaking navy are called the "Medical and Civil Branches," is a use of the word entirely peculiar to ourselves.

"Staff" is a military word (used also in industrial life) with a clear, distinct and accurate meaning. As we use it, to designate certain corps in our navy, the word has no connection with "staff" (état-major) as universally recognized.

It is, however, only with the staff officers of the pay and construction corps that the prinicpal references of this essay deal. They are the only ones which could come under the head of commercial and industrial forces.

Considering the first claim, I quote as follows:

(Par. I.) There is such confusion and interference between the two classes of forces, the strictly military and the industrial and commercial, ...

(Par. V, p. 42, line 17.) The supplies and accounts corps, handling the stupendous problems of demand and supply of the fleet and the industrial and commercial elements, ...

Here the industrial and commercial elements are put in one case in contradistinction to the fleet, and in the other to the strictly military forces. It is misleading, though, to state that it is the supply and accounts corps that have the "stupendous problems of supply and demand" to "handle." These problems are all solved by the material bureaus—the supply and accounts corps doing the buying and commercial carrying.

(Par. V, p. 43, line 2.) So it is the gravest kind of an error to compel or allow these sea officers of the line to perform duty at any time in their career that is not connected directly with the fleet and which does not continue to keep them sized up to "best" in their sea profession.

Absolutely sound! But what duties are "connected directly"? There would undoubtedly be various opinions.

Taking this with the others, one is again led to think that the essayist is of the opinion that it is staff officers who are, or should be, the industrial and commercial forces of the navy.

(Par. XI, p. 50.) The control of the industrial and commercial forces of the naval establishment is next in importance to that of the fleet, considered as a completed element, ready for service. If these forces do not have their day in court in the work on the re-organization of the department, the country will rue it.

The writer feels certain that his comrades, the sea officers of the line, are on the wrong tack when they seek to have control of these forces.

The above quotations certainly justify the statement that the essayist is making what is noted as the first claim. If so, let us examine the claim, and see what there is to it.

Any one familiar with the industrial and technical renaissance of our "new navy" some twenty-five years ago, knows that that development was brought about principally by the industrial, commercial and technical energies of the line officers and engineers.

Both were comparatively a-plenty. A line officer laid the blocks and superintended the first preparations for building the old *Maine*. They *had* to do such things. There was no one else. They were and are technical men, and every class graduated from Annapolis receives increased technical training.

Line officers now, more than ever, are the technical officers of the navy. They control and direct intricate mechanisms of all kinds—living with, and working with, the tools in their hands.

Take another phase of claim first.

The Appropriation Bill for 1909, gives us the following "industrial and commercial amounts":

$39,000,000.00 controlled by line officers.
$28,000,000.00 controlled by constructors.
$ 4,250,000.00 controlled by pay corps.

These round figures give some idea of the "industrial and commercial forces" of the naval establishment.*

This merely shows how inappropriate it is to suppose that the "staff" are the entire industrial and commercial forces of the navy, or even a greater part thereof.

In the Civil and Spanish Wars the ships were equipped, armed and supplied (except clothing, small stores, and food) almost entirely by the line. This was before the extension of the general store-keeper system.

Consequently it is seen how fallacious it is to suppose that the navy's industrial and commercial forces are not composed in the majority, of the "generalist" not "specialist," elements in the navy.

These "generalists" are the line officers, and it is vital to the ability of the fleet to maintain itself, that it should be supplied, equipped and armed, by and under the control and direction of these same general technicians—line officers.

It is thus impossible to separate the commercial and industrial forces from the main body of line officers. When that is done we

* All "civil establishments" and "public works" (under civil engineers) are omitted, as not coming under head of "fleet."

Industrial amounts only are considered. "Increase of the navy" is prorated, where not specific. "Coal" is given 4 millions to pay corps, and 1 million to line, for handling, etc. $250,000.00 to pay corps for "handling stores." Pay corps handles $6,500,000.00 of provisions. Clothing fund is self supporting. Naval supply fund is a vehicle for book-keeping.

violate the primary principle of all enterprises—subordination of all parts to the "main purpose."

Let us take certain other parts of the essay illustrating this apparent tenor of thought:

> Now to expose a false premise upon which custom has been established, and from which important parts of proposed re-organization have been started.
>
> Take the fleet ready for service; there is no one who can tell the sea officers of the line manning the ships what to do in the way of handling them in a naval sense, working the guns, etc., and no other should attempt to interfere in that technical work.
>
> But that is absolutely all *in the way of immunity* of these sea officers of the line from outside interference. Because they have been and must always be the supreme controllers of the great fighting aggregations on the sea, so far as being war machines, *it does not follow* that they should be supreme controllers of the shore establishment, or even necessarily of war policy and strategy (p. 43).

The italics are mine. Does this mean that sea officers should have nothing to do with the preparation for war, but only war itself? The statement certainly restricts them to that duty. What does "supreme control of the shore establishment" mean? Strategy is entirely military. Did the navy ever control "war policy?"

Imagine a fleet designed in its entirety, engined, equipped, gunned, recruited, located, directed, and strategically handled, by those members of the naval establishment, not sea officers!

Yet the essayist (in this paragraph) so restricts their duties.

Imagine any business run on such principles!

It is statements of this sort that have just been shown to be fallacious. The attempt to differentiate between a sea and shore establishment is logically futile. There is no point—such as the *coast line*—where the principle controlling the navy changes, and a new principle governs.

To say that the Secretary of the Navy is the military head of the navy is entirely in error. He is the head of the navy—a much greater position. He is not the coordinator. He is above and over the coordinators of the various forces.

There is no specific military head. If there were, he would absolutely be subordinate to the head of the navy.

In spite of the essayist's statement to the contrary (p. 50, par. XI, line 19), this is the only view within the knowledge of the writer. It is certainly the only logical view.

All activities in the navy imminently affecting the fleet ready to fight, are subject to military domination.

And this word "domination" doesn't mean interfering with the recognized specific duties of the commercial and industrial forces. It does not mean dictating the thickness of bilge plating, where beans shall be bought, the ballistic tests of armor, or the method of forging anchor chains.

These things must all eventually pass the test of the fleet, and the essayist recognizes this fact, naturally.

But this fact of final test is no basis for organization.

There is only one navy. There is not a sea navy and a shore navy; nor is there a military navy, a commercial navy, an industrial navy, and a technical navy. Nor is the purpose controlling these any but a military purpose.

A shore station is as "naval" as the fleet, and is *for* the fleet. It is not a commercial and industrial entity. It is not an independent part of the naval establishment.

Rear-Admiral Bradford says:

> Reference has been made by the Board, in a conspicuous manner, to the methods followed by large shipbuilding works and the commendations of the managers of these works of the proposed non-duplication of buildings for a navy yard. It occurs to me that these managers are not familiar with the needs of a navy yard. It is proper here to point out that there is very little similarity between a large navy yard, such as New York, and a shipbuilding establishment.
>
> A navy yard is an arsenal, and frequently so-called in foreign countries. It contains a great victualing department; a large quantity of guns, mounts, ammunition, torpedoes and ordnance stores; a hospital, medical laboratory, medical stores and accommodations for the sick; clothing and small stores; all appliances needed for the construction of public works of a varied character, including dredges, lighters, derricks, pumps, locomotives, cars, carts, horses, fire engines, hose wagons, etc.; all articles used to equip ships, viz., sails, awnings, and other canvas stores; rigging and cordage of all kinds; anchors, cables, galleys, and chains; stationery and books; nautical instruments of all kinds; library books; cooking utensils and table ware; signals of various kinds; charts and nautical books; flags; electrical appliances; barracks, or receiving ships, and their out-buildings for enlisted men, and barracks and out-buildings for marines,
>
> . . . .
>
> These companies (private shipyards) apparently have more officers, a greater staff, more buildings, and more departments than the navy for similar work, although their work is far more circumscribed. (Report of Chief of Bureau of Equipment, 1903, pages 94 and 96.)

To try and show briefly the relations between the elements and factors in the naval establishment and those in other well-known businesses, let us take a railroad for example:

The mobile portion is the "road" (fleet).

The stationary is the "shop" (navy yard).

The controlling element, "financial gain" (war).

In the railroad the shop is *for* the road and its equipment.

The shop has the "readiness of the road" as the controlling reason for its every activity.

One who knows what is necessary for the road "controls" the shop.

The road is run for "financial gain."

The paraphrase is complete.

This method can be applied with success to any other cognate business. Hence, I say, that any view, contending that a special part of a "business" is not dominated by the controlling element in that business, is opposed to all standards, public and private.

But is must be carefully noted, in this connection, that the "control of administrative details" is in no-wise stated to be the same thing as "subordination to the ultimate purpose."

The guiding control and direction of each factor is determined by the "ultimate purpose" for which any organization is maintained. In the case of the naval establishment this is "the fleet ready to fight," that is, "war."

Some people get their notions of the "commercial and industrial forces" of the navy by applying the *organization* of the large merchant fleets as a criterion. This is entirely erroneous. In fact it is "end for end."

The fleet of the Hamburg-American line, for instance, is the thing by which the company makes money. It is maintained by them for this purpose—to make money. The shore-end of a commercial fleet is the reason for such fleet's existence. It is the purpose for such existence.

In a country's war fleet this is just the opposite. The fleet's existence is the reason for a shore-end to the navy.

Hence we see the complete contradiction of the guiding principle in organization at the outset.

This, however, does not mean that details of administration of special branches are to be in the hands of the "generalist"; on the contrary, that is just why specialists are necessary.

It does mean, though, that in matters affecting the object for which any business is "run," those engaged in special details must be subordinate to those engaged in "running the business."

It is thus seen that there is no separate shore navy and sea navy. It is all one navy and each part is maintained for, and bears a more or less intimate relation to, the main part—the fleet.

Consequently to admit that such an important part of the naval establishment as the "shore-end" of the fleet can be managed and controlled by any other branch of a navy than those who fight and maintain the fleet, is to admit a condition that is illogical—whether from pure reasoning on principles, historical research, or commercial and industrial practice.

No, there is no shore navy, separate from the sea navy. It is all one navy, and experience on shore fits the officers of the fleet for their duties at sea, as well as sea duty fits them for the technical duties they find ashore. They are complementary and necessary to one another. To quote again:

> So, at the point where the line officer is obliged to break off, to keep his sea efficiency intact, the staff corps begin. If this reasoning be sound, then any staff corps is precluded from taking upon itself duties that a sea officer of the line can perform without affecting his efficiency. This is an important point; . . . . (p. 45, 2d par.).

This certainly *is* an important point. In certain lines only the staff corps are at home. Those lines undoubtedly are theirs. No one attempts to deny it. Their duties are important and necessary. No one attempts to deny it. They bear directly on military efficiency. No one attempts to deny it. No line officer should perform such duties. That is clear.

The staff should have and do have entire control in these lines *up to the point* where the streams of their special energies must be directed according to military *experience*.

Pay Inspector Mudd claims that the Secretary has this military experience. The claim of this reply is as this paper shows.

Another thing to remember is that efficiency in line officers is *for* the fleet. The fleet was not brought into being for the specific purpose of training line officers. The officers are for the fleet—not the fleet for the officers.

Hence they must be trained to maintain it.

Experience (and logic) in our navy shows us that the best way to do this is as we have been doing it. The easily trained natural

technical abilities of our officers is where we score over the naval services of foreign nations.

It is this double duty that enables our fleet to be properly engined, gunned, and equipped, and gives our line officers that knowledge of mechanical processes necessary to do these things.

Final test alone by the fleet (as the essayist suggests) would be a tardy, expensive and inefficient way of accomplishing results—even if any good results were obtainable by that method.

Without being specific as to names, we all know what havoc such a system has wrought with a once powerful navy.

Does anyone imagine that our fleet could have run 42,000 miles without mishap, trained for two target practices enroute, no accidents, and self-maintained throughout, unless there had been this complementary training.

The speciality of the different staff corps are clearly defined (changing and developing from time to time) and they are a distinct part of the maintenance of the fleet. But they are not an independent part, nor a strictly military part.

While their training teaches them *all* concerning their own duties, the *scope* of these duties, in relation to the fleet, is a strictly military one.

That is to say, any modification *in that scope,* no matter by whom proposed, should bear scrutiny as to its military aspect before submission for action.

This is only logical, as their specialties bear an intimate relation to the " ultimate purpose "—the fleet ready to fight.

The second claim I read is, that Pay Insepector Mudd says: "The staff is *officially* independent, and hence co-equal with the line."

It has just been shown that each staff corps is an integral and important part of the officers in the navy.

Confining ourselves (as previously) to the commercial and industrial elements, we find these numbers (Jan. 1, 1909):

(1) 2214 Line officers.
(2) 69 Naval constructors.
(3) 201 Pay officers.

Relative numbers alone give us here an indication of their official position.

The essayist, as I read him, divides the officers of the navy into

sets of independent activities, each to be coordinated as a whole, in relation to the "ultimate purpose" by the Secretary.

The line officer is the "fighting specialist," the pay officer the "supplies and accounts specialist," etc.

Now how can these be independent of the "strictly military" (sic) forces, when not a single one of these staff activities (claimed to be independent) would exist if it were not for the existence of the "specialist fighter." The "specialist fighter" is the only reason the others exist at all. Take him away and the staff duties lapse of themselves.

It is clearly fallacious reasoning, therefore, to infer directly or indirectly that the second claim is true.

This may be perhaps more clearly shown in this way: Suppose every line officer were swept out of existence. There would be no fleet. The navy would cease to exist. Suppose the same thing happened to the staff. The fleet would be ready to fight, and would continue to be ready to fight. The expense would probably be increased until civilians or transferred line officers were taken in to form new staff corps.

But there would be no stoppage.

It is thus seen how utterly *unequal* in official importance are the line and the staff; and how entirely *dependent* the staff is upon the line for its raison d'etre.

These are cold facts. But let us treat them as such. Do not mistake any of these statements and counterclaims as any thing but what relates to *official* position. Let us remember that official inequality doesn't mean social, mental, moral, physical, professional, or any other kind of inequality. It means *official*—and on official relations only rest the whole fabric of the naval establishment.

The third claim of the essayist I take to be: "The line should *not* be officially dominant."

This is the entire tenor of the essay, and is especially dwelt on as regards the industrial and commercial elements.

The inference in a number of places is, that in endeavoring to secure military coordination for all the elements of the naval establishment, directly related to the fleet, the line is guilty of improper interference. It is merely another way of asserting the independence and co-equality of the official relations of the line and staff.

The writer in this reply has clearly shown his hand, and stated his entire condemnation of interference *within* the scope of the non-military activities in the naval establishment. I never heard of any officer who disagreed from such a principle. Such interference is always to be righteously resented.

This is not, however, the essayist's idea, as I gather it. His is as above stated.

When the paramount dominance of the military idea is thoroughly understood by everyone, this other idea (the third claim) that *everything* is interference, will vanish of itself—logically.

There is no question of the military dominance of the Captain on board ship. There is no resentment against it. How then can there be logically any resentment against the *official* domination of the line. The governing principle, both on board ship and in the naval establishment is the same—absolutely identical.

Improper domination should be guarded against. Resentment against the manner or method of administration, or against personality, is a logical, and at times, a desirable basis for protest.

But there can be no logical resentment against a logical *official* relation.

From every event of history, our own and foreign, the "patriotic economist" is aware that the force fighting the fleet is the ultimate and largest factor in its efficiency.

They are the ones responsible to the country for its battles.

No success in war is assured, without the ultimate subordination to them, under the solely responsible and authoritative head of the navy, *of all preparation for war.*

The fleet exists to fight—a purely military function. Therefore, *in* the naval establishment this preparation for war must be dominated by the strictly military branch, under the Secretary.

The military establishments exist for the people. The constitution and laws enable the people to dominate these establishments. And they can do so in any way they see fit.

They do so by the executive branch of the government.

But it is logically unthinkable to imagine that the people wish their military interests to be dominated *in these services,* by any other than military ideas of the latest and best procurable for the money they expend.

In the Treasury Department the dominating idea is the national

finances; in the Agricultural Department, the good of the national agricultural interests; in the Department of Justice, the legal interests of the nation; in the Post Office Department, the transmission of the mails in, and for, the people's interests, etc.

So, I say, it is unthinkable that in their two military departments they desire other features to dominate than the highest military interests of the nation. This the nation shows plainly by its constitutional acts in Congress.

The nation maintains at Annapolis an expensive plant for educating picked representatives in the military branch of the naval profession. They are the ones whom the nation trains to the end that its fleet may be ready to fight.

Many as our shortcomings are, many as are our desires in all branches of the service, for betterment, such betterment can only proceed when founded on the logical principles governing all enterprises, and clearly indicated by the Constitution and the people in Congress assembled.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE UNCERTAINTIES OF GEOGRAPHICAL POSITION IN POLAR EXPLORATION.

By G. W. LITTLEHALES.

The explorers who penetrated the Arctic regions, carried with them instruments for measuring the altitudes of celestial bodies above the horizon and also chronometers or watches intended to show, from instant to instant, the time of day at the meridian of Greenwich.

An observer who has determined the altitude of a celestial body at a given instant of time has in reality located himself at the end of a radius whose length is the zenith distance, or ninety degrees minus the altitude of the celestial body, and whose origin or center is the geographical position of the observed celestial body, or that place on the surface of the earth which is vertically under the observed body at the instant of observation. In the absence of knowledge of the precise direction of the radius, the only definite information to be obtained from the observation of the altitude of a celestial body at a given instant is that the observer is located on the circumference of a circle described by the radius.

Each separate altitude and corresponding Greenwich time of observation, whether it be of a different celestial body or of the same celestial body in a different quarter of the heavens, will result in one of these circles of position; and it is by the intersection of the circumferences of two or more of these circles that the actual geographical position of the observer is fixed.

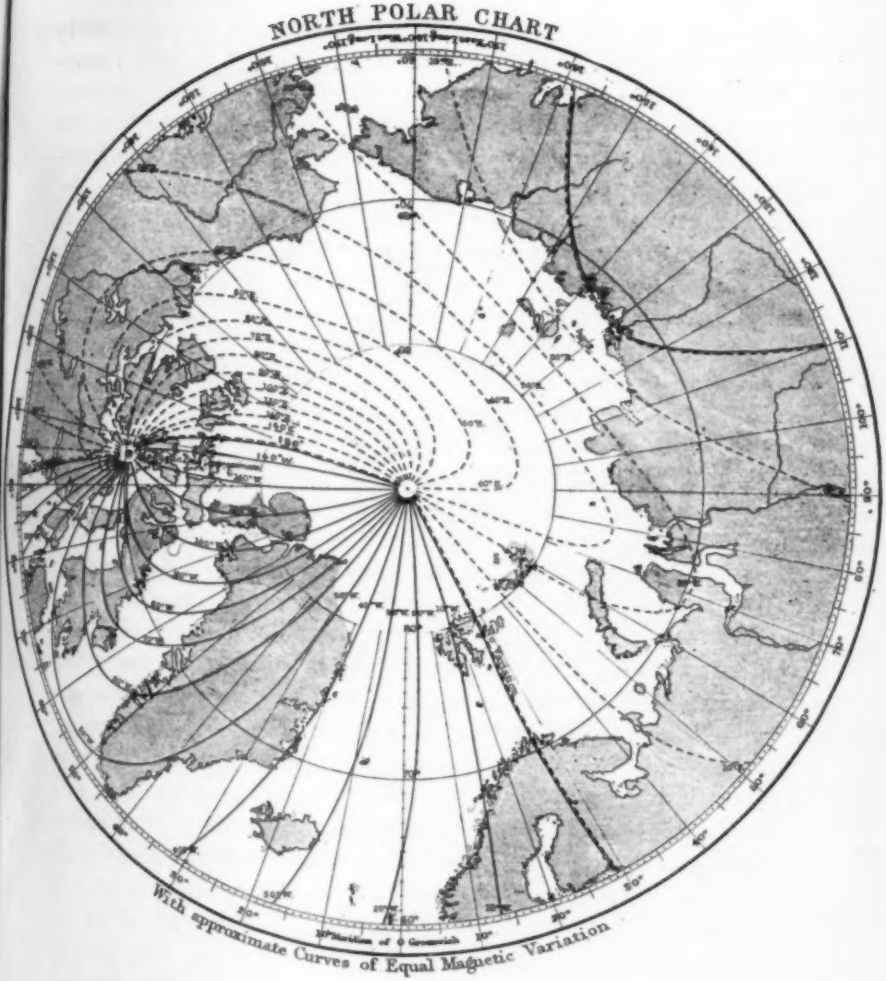
Of course, if the observer has moved in the interval between two observations, it will be necessary, in order to find his geographical position at the instant of the second sight, to consider the center of the first circle of position to be moved in a direction repre-

sented by his true course between the stations and by an amount equal to the distance between them. Here an obstacle supervenes in finding geographical positions in the polar regions, especially on the American side of the Arctic zone, because the compass is weak and has a directive force scarcely one-fifth of its intensity in the equatorial regions of the earth, and the variation of the compass, or the pointing of the needle away from the true north, changes very rapidly from place to place and is of very large amount, as shown by the accompanying figure in which each of the variation curves passes through all places where the variation of the compass has the same value as that marked on the line. The direction of travel is, consequently, uncertain on account of the variability of the compass, and the direct distance between stations must also vary widely from accuracy on account of the capricious nature of travel over ice and the consequent uncertainty in the measurement of the distance traversed. It is, therefore, obvious that, unless the explorer observes the altitudes of two different celestial bodies at the same station or remains there long enough to observe the same body in two different quarters of the heavens, he cannot exclude from the process of fixing his geographical position the uncertainties that are visualized by considering the center of a circle of position to be moved in direction and distance by the ill-determined resultant of travel and drift between two stations.

But apart from the source of error in geographical position thus arising through finding the intersection of circles of position, it is of chief concern to examine into the particulars of a single circle of position by itself. Evidently the places on the surface of the earth which shall be passed through by the circumference of such a circle of position, *i. e.*, the meridians of longitude and parallels of latitude which it crosses, must depend upon two factors. These are the position of the center and the length of the radius.

THE GEOGRAPHICAL POSITION OF THE CENTER OF THE CIRCLE OF POSITION.

The position of the center is always in a geographical latitude equal to the declination of the observed celestial body at the instant of observation; and in a geographical longitude equal to the hour-angle of the celestial body from the prime meridian, which, in the case of the sun, is equal to the Greenwich apparent time at the instant of observation, and, in the case


NORTH POLAR CHART
With approximate Curves of Equal Magnetic Variation

of the moon or planets or stars, is equal to the difference between the Greenwich sidereal time [Greenwich mean time expressed in sidereal time + sidereal time of Greenwich mean moon (R. A. M. S.)] and the moon's or planets' or stars' right ascension. As the declinations of the celestial bodies are tabulated in the American Ephemeris and Nautical Almanac, published annually for some years in advance under the authority of the Navy Department, no element of doubt can attach to the latitude of the center of the circle of position. For the determination of its longitude, however, the position of the earth with reference to the celestial sphere must be known in respect of rotation. This requires that the Greenwich solar time or sidereal time be known, and, as there is no agency at work for determining these in Arctic explorations, excepting the chronometer, the correctness of the resulting longitude will always be dependent upon the accuracy of the chronometer time. It will not escape attention, therefore, that a circle of position—whatever its radius may be—will be displaced on the globe to the eastward or to the westward of its true position by the amount of the inaccuracy of the chronometer time at the instant of the observation of the altitude upon which the radius of the circle depends.

There are instances in which the performances of chronometers in Arctic exploration have appeared to be very satisfactory. In a letter to the makers of some of the chronometers that were used in the Grinnell Arctic Exploring Expedition, Maury stated: "The instruments have been subjected to the severest tests to which it is possible to subject instruments of such delicate construction, yet so exquisitely were they provided with adjustments and compensations for the very great extreme of temperature to which they were subjected that one of these, No. 114 Loseby, after having suffered all sorts of experience to which such instruments are liable in a polar winter, is returned with a change in its daily rate during seventeen months of only .03 sec." But it would be mischievous to spread the impression that the errors and rates of chronometers are not subject to large uncertainties in these remote regions, exposed as the instruments are to many physical influences that would naturally tend to disturb the regularity of their performance. The sources of error arise from variations of rate on account of change of barometric pressure, on account of change of temperature, and on account of change in the circumstances either

of rest or motion. Under the most favorable conditions for the excellent performance of chronometers, the average change of daily rate between one week and the next exceeds 1.2 seconds; and the average liability to error in the daily rate between one week and the next is not far from 3 seconds. It would be beyond the bounds of reasonable expectation to find exhibited by chronometers in transportation a closer approach to regularity than is shown by those in use on board vessels in the trans-Atlantic passenger service. Averages obtained from a large number of observations, made under these conditions of transportation, in which all the circumstances conspire to give the most favorable results, indicate that a chronometer of average quality will, at the end of 20 days, show an error of 10 seconds; and that an error of 3.2 times this amount must be looked out for.

The quantities in the following table, compiled by Hartnup, represent the error at the end of a passage of given duration, under the average conditions of oceanic voyaging:

Duration of voyage in months.	Average error from 1700 chro.	Best 10 in 100.	2d best 10 in 100.	3d best 10 in 100.	4th best 10 in 100.	5th best 10 in 100.	6th best 10 in 100.	7th best 10 in 100.	8th best 10 in 100.	9th best 10 in 100.	Worst 10 in 100.
	Mi.	*Mi.*	*Mi.*	*Mi.*	*Mi.*	*Mi.*	*Mi.*	*Mi.*	*Mi.*	*Mi.*	*Mi.*
1	6	0	1	1	2	3	4	5	7	9	25
2	14	0	2	4	5	7	9	11	15	24	62
3	23	1	3	6	9	12	15	18	25	41	101
4	33	1	4	8	13	17	22	28	36	61	143
5	44	1	5	10	17	22	29	39	49	84	187
6	56	2	6	13	21	28	37	50	64	108	233
7	69	2	8	16	25	34	46	62	80	134	280
8	82	3	10	19	30	41	55	74	98	159	328
9	95	3	12	22	35	48	65	86	117	184	376
10	108	4	14	26	40	56	75	98	137	208	425
11	122	4	16	30	46	64	86	111	157	233	474
12	136	5	18	34	52	72	97	124	178	258	524

Mr. Hartnup made an additional investigation, obtaining the following results:

	Extreme difference of mean daily rate between any 2 weeks.	Variation of daily rate due to change of temperature.	Mean of extreme difference between any 3 days of each week.
	s.	*s.*	*s.*
Mean from 297 chronometers ...	2.19	1.73	0.98
Mean fron 40 poorest	6.28	4.55	2.80
Mean excluding 40 poorest.....	1.56	1.29	0.70

Under adverse conditions of transportation, a single chronometer is likely to lead to results widely divergent from the truth. For this reason it is commonly considered a necessity in navigation to carry three chronometers, and there are numerous instances in which it has been revealed that, because of abnormal vibration, all three went wrong to such an extent as to put the observer twenty, thirty, or even forty miles out of his proper position.

The liability to error of the best chronometer-watches would be at least twice as great as that which has just been indicated to be the liability to error of chronometers of average quality under the circumstances of oceanic navigation.

THE RADIUS OF THE CIRCLE OF POSITION.

The accuracy of the radius of the circle of position depends solely upon the measurement of the altitude of the observed celestial body. The sextant is the astronomical instrument which has been generally employed for the measurement of altitudes by the polar explorer, as its portability and the simplicity of its manipulation enable him to secure the data of observation with a minimum expenditure of time. Being held in the hand without fixed supports, and having small dimensions, the accuracy of fixed instruments is not to be expected from it. A comparison at observatories and other fixed stations of the true latitudes with the latitudes deduced from long series of altitudes observed by sextants in the hands of the most trained and skillful observers show that, even after the constant errors were thoroughly investigated and the resulting corrections were applied, outstanding differences of as much as 64″ existed. It is not to be expected that the constant errors can be successfully eliminated from measurements made in the Arctic under the conditions of polar exploration. They include errors arising from eccentricity of the center of the radius arm and the center of the arc, from faulty graduation, and from flexure of the frame of the instrument caused by varying temperature and accidental blows. In a first-class instrument in perfect order, they may not amount to much in the resulting altitude after the index correction is applied, but, on the other hand, in an inferior instrument, and after careless treatment, it is not likely that the effect of these errors will be less than three minutes. Besides the instrumental errors, irregular or accidental errors, such as errors

in the refraction in the rays of light from the observed celestial body produced by anomalous changes in the density of the atmosphere, and personal errors, arising from peculiarities of the observer and the imperfection of his senses, are always present to produce a further liability to error in the measured quantity.

On the rare occasions when the hummocky surface of an ice-covered sea does not shut out the view of the natural horizon, the use of this line as an origin of measurement of the altitude of a celestial body is attended by grave uncertainties owing to the deflecting influence of the varying atmospheric conditions through which the rays of light pass from it to the observer. The Rev. G. Fisher, astronomer of Parry's Arctic Expedition, observed a variation in the apparent place of the horizon of 18′ in the Arctic regions, and there are indications that this amount may be much exceeded even amidst appearances that are devoid of every suggestion of irregularity. Sometimes these prevalent disturbing conditions of the Arctic atmosphere are made evident to the senses by the presence of mirage in consequence of which objects near the horizon are distorted in a vertical direction with the occasional appearance of a second image of the same object inverted above the first, and even a third above the others.

As general dependence upon the natural horizon is precluded, recourse must be had to the use of some form of theodolite for the measurement of altitudes of celestial bodies or else to the employment, in conjunction with the sextant, of an artificial horizon. The usual form of artificial horizon, consisting of a small rectangular shallow basin of mercury with a glass roof to protect it from the agitation of the wind, is of limited utility in the Arctic, both because mercury freezes at a temperature about —40° Fahrenheit and also because altitudes measuring less than 18° can rarely be found with it, since, when the altitude is low, the observer is obliged to increase his distance from the reflecting surface and thus incurs great difficulty in keeping sight of the image reflected in the fluid.

Oil and alcohol have been used as substitutes for mercury in the shallow basin, and, although the utility of the horizon is thus preserved against freezing, its availability for the determination of low altitudes is not thereby extended.

Instead of the liquid artificial horizon, a glass plate is some-

times used, standing upon three screws, by means of which it is levelled, a small spirit level being applied to the surface to test its horizontality. The lower surface of the plate is blackened, so that reflection of the celestial body takes place only at the upper surface. It is exceedingly difficult to level a mirror-horizon in exploratory travel, and, as the amount of its default from horizontality in the direction of the observed celestial body is transmitted undiminished into the resulting measurement of the altitude, it becomes the purpose of the observer to ascertain, by means of the spirit level, the amount of this default at the time of observation and to record this amount as a correction to be applied to the measured altitude, rather than to attempt to bring the mirror into a precisely horizontal position. The expectation would, therefore, be that observations taken with the mirror-horizon should always be accompanied by spirit-level readings of the amount of default from horizontality in the mirror, in order that the important errors thus introduced into the instrumental indications may be subsequently eliminated from the deduced altitudes.

All the usual sources of error that present themselves to mar astronomical observations under the best conditions are intensified in the frozen zones. Benumbed limbs and fatigued vision magnify the personal errors, and the instrumental errors are greatly enlarged by the effects of low temperature which causes the frost to cover the lenses and mirrors of the instruments and the intense cold to freeze the lubricating oil in the joints and to crack and granulate the silver backing of the mirrors.

The flattening of the discs of the sun and moon when near the horizon has often been noticed. This appearance indicates how strongly the rays of light near the horizon are refracted in traversing the atmosphere. The last direction of the ray, or that which it has when it reaches the eye, is that of the tangent to its curved path through the atmosphere at this point; and the difference of the direction of the ray before entering the atmosphere and this last direction is the amount by which the measured position of the celestial body is displaced in altitude from its true position. Since the amount of the refraction depends upon the density of the atmosphere, and this density varies with the pressure and temperature, which are indicated by the barometer and the thermometer, the refraction tables give the refraction for a *mean* state of

the atmosphere; and auxiliary tables are furnished to correct the mean refraction for moderate departures of pressure and temperature from the normal values, but not for such extreme departures of temperature as are experienced on the ice-cap of the Arctic Sea. For altitudes below 5° no refraction tables can be relied upon. There occur at times anomalous deviations of the refraction from the tabular values at all altitudes; and these are most sensible at low altitudes. Unfortunately the sun and the moon are always close to the horizon in the polar regions and the reduction of measured altitudes of these bodies for the influences of refraction is subject to large uncertainties.

It has already been remarked how far the natural horizon of an ice-covered sea may appear displaced from its true position and, although this displacement may not be taken as a measure of the amount by which the rays of light from a celestial body near the horizon are deflected in their passage through the atmosphere to the eye of the observer, yet it will serve as a gauge of the amount of variability that should be expected in the tabulated refraction for small altitudes observed in low temperatures of the atmosphere. The tabulated refraction for an altitude of 5°, with the temperature at — 10° Fahrenheit, is 11′, but experience has shown that, with wide departures from the normal state of the atmosphere, it might on the one hand be one-half as much and on the other hand fifty per cent more.

For my own part, I have great respect for the opinion of an observer who tells me that he is unable in the Arctic to find the altitude of the sun within 5′, and would conclude that he could not determine the radius of his circle of position closer than that amount.

From the other source of error, the uncertainty in the chronometer time and the consequent uncertainty in the position of the center of the circle of position, there is a measure of relief in the near approaches to the pole. For the conditions of nature intervene to make the distance between meridians less in proportion as the difficulty of transporting chronometers for time in this remote region become greater, and in latitudes near 90° the close convergence of the meridians of longitude makes it of less and less importance to ascertain the position of the earth with reference to the celestial sphere in respect of rotation. But, although an

uncertainty of a few degrees of longitude will not be of moment to observers in very high latitudes, yet any error in the length of the radius of the circle of position continues to operate with full effect until the pole itself is reached.

If we express the geographical position of the explorer, as fixed by the intersection of two circles of position, in the form of a distance, Q, from some definite place on the earth's surface, then we may regard Q as some function of R and R', the radii of the circles of position, of P and P', the positions of the centers of the circles of position, and of L, the shift of the center of the first circle for the travel of the observer between the two stations at which observations were taken, thus

$$Q=f\,(R, R', P, P', L).$$

The relation between the actual error of the determined geographical position, or the actual error of Q, and the errors of the quantities on the right hand side of the equation will be

$$d(Q)=\frac{dQ}{dR}\,e_R+\frac{dQ}{dR'}\,e_{R'}+\frac{dQ}{dP}\,e_P+\frac{dQ}{dP'}\,e_{P'}+\frac{dQ}{dL}\,e_L,$$

and the expression for the square of the probable error of Q will be

$$e^2=\left(\frac{dQ}{dR}\right)^2 e_R^2+\left(\frac{dQ}{dR'}\right)^2 e_{R'}^2+\left(\frac{dQ}{dP}\right)^2 e_P^2+\left(\frac{dQ}{dP'}\right)^2 e_{P'}^2+\left(\frac{dQ}{dL}\right)^2 e_L^2.$$

Upon the moderate assumption that the probable errors of the two centers of the circles of position are respectively 15′ and 2′, the probable error of the radius of each circle of position 5′, and the probable error of the shift due to the travel of the observer between observing stations 3′, the resulting probable error of the deduced geographical position would be

$$e=\sqrt{5^2+5^2+15^2+2^2+3^2}=\sqrt{288}=\pm 17'.$$

AT THE POLE.

Whatever the difficulties of observation may be and whatever the uncertainties in fixing the geographical position in the lower latitudes of the polar region, when the latitude of 90° is attained these difficulties vanish and there is a comparatively easy certainty of recognizing that the pole has been reached. To an ob-

server here, the pole of the heavens coincides in position with his zenith, and the necessary and sufficient condition to be recognized is that all stars north of the celestial equator would, if the sun were not lighting the sky, remain permanently visible above the horizon, never rising nor falling at all, but moving on circles of altitude lying parallel to the horizon and coinciding with their circles of declination. At the time of year when our explorers have reached the pole, it is unending day for six months. From the 21st of March, when the sun's center has passed upward over the rational horizon, his image, lifted somewhat in the sky by the effects of refraction, has continued, as viewed from this position, to move, throughout each encircling turn, in a path varying from strict parallelism with the horizon only by the amount of the daily change in the declination. By the middle of April, the encircling courses have reached a true altitude of almost 10°, which does not alter from constancy of height above the horizon much more than 20′ throughout the twenty-four hours. It is, therefore, unnecessary for the observer to do more, for the purpose of identifying his position, than to recognize this condition. The account of time is of no farther concern to him because all meridians have converged into one point, and it is not even required of him that he should be able to measure the absolute altitude of the sun but only that he should be able to test the condition of equality of altitude within the range of 5′ in the duration of 6 hours. Precision in his location cannot be expected, because, while he waits, the ice on which he stands is drifting—maybe not rapidly, but at an unascertained rate.

PROOFS OF HAVING ATTAINED THE POLE.

In the absence from the route to the North Pole of any permanent physical features that could be described or marked for identification, the only avenue of proof of having made his journey that could be open to an explorer would be through the record of the compass directions that he followed and the measured distances that he traversed along each of them, and also the original records of the astronomical observations that he made for the purpose of determining his geographical position at the various stages of his march. The instruments of observation would be of no importance in this connection excepting as a means of con-

tributing to the collateral issue as to whether the observations were inadequate or valueless through having been made with instruments of unsuitable design or construction.

Since our moderate assumptions concerning the probable errors of the factors entering into the determination of the explorer's geographical position have shown that the uncertainty in such a determination is of the same order of magnitude as the extent of his daily march, the solution and plotting of the observations would be quite likely to make it appear that the route did not proceed by successive stages toward the destination, but that advance may have alternated with apparent retreat and have been attended with deviations now to one side and now to the other of the intended line of progress.

A STUDY OF NAVAL STRATEGY.*

By Commander R. Daveluy, French Navy.

Translated by Philip R. Alger, U. S. Navy.

SECOND PART.

THE ELEMENTS OF NAVAL STRATEGY.

*A second and revised edition of Lieut. Daveluy's Étude sur la Stratégie Navale has just appeared as the first volume of a work entitled L'Esprit de la Guerre Navale, of which the second volume will be a revised edition of the author's Étude sur le Combat Naval, and the third volume a new work on the organization of naval forces. The translation appearing in the Proceedings will follow the new edition, and the portion published in the September number will be changed to correspond to the new edition before the entire translation is issued in book form.

I.

Offensive and Defensive.

After having passed in review the methods that strategy has at its disposal, we have to consider what the elements are that strengthen or weaken its action. These elements are of a very variable nature, and first among them are found the offensive and the defensive.

The offensive, it is said, is the weapon of the strong; the defensive, that of the weak. This is true on land: armies, in proportion as they separate themselves from their bases to penetrate into the hostile country, distribute along the route a part of their forces to keep guard over the safety of their communications. It is natural, consequently, that the weaker side should prefer to remain in its own territory in order to have the whole of its forces available. Its numerical inferiority is further compensated by the defensive works that it will have been wise enough to accumulate in the path of invasion. With the aid of these obstacles, it will arrest the enemy's progress long enough to ascertain the situation and to mass its troops at the desired point with the help of its interior network of railroads.

This system of operations is justifiable if it leads to battle. If the contest turns to the advantage of the weaker, he destroys the cohesion of his adversary; demoralizes him, takes from him prisoners, who are pledges. He can thus restore the balance of numbers and in his turn assume the offensive.

The naval defensive is quite a different affair. A fleet can scarcely, at the present time, make up for its numerical inferiority by supporting itself with fixed defenses. It only secures the assistance of coast batteries in the interior of roadsteads or in the channels that give access to them; but roadsteads and channels are not fields of battle that can be highly regarded in a naval war. Moreover, defense in this sense falls within the scope of tactics, and it is not apparent how strategy can force the enemy to accept combat under such conditions."

"Fixed defences have often furnished material assistance to fleets of sailing ships. When these ships found themselves compelled to fight near

On the sea the defensive is rather a question of words than one of fact. This is the consequence of the rather peculiar character of naval forces.

The army to which we were alluding has to assure the safety of its territory and to impose upon the enemy the law of the stronger; it has attained its double object when it has invaded the territory of its adversary, taking from him thus every means of continuing the contest.

The navy, for its part, cannot take possession of the land; it has been created to guard maritime interests, whether those that pass to and fro over the seas or those that have gathered in ports. When a war breaks out, the rôle of the navy becomes very complex. It always retains the mission of protecting wealth that is afloat, a mission so much the more imperative as this wealth forms a greater part of the national capital; but besides this, it must keep guard over the seas to prevent every attempt at invasion of the home country or her colonies. This latter is the defensive part of its task. But not all of it: the struggle having been entered upon, it is necessary to strive to get the upper hand, and this leads to attacking in the adversary's country the interests that one protects in his own. This is the offensive side. The navy thus has very diverse problems to solve; it is pulled about by multiple necessities. Not being able to make headway everywhere at once, it is obliged to choose between the protection of its own interests and the attack upon those of its adversary, and, according as it has more to lose or to gain, it adopts the defensive or the offensive. Considering things from this very broad point of view, it may be concluded that it is the weaker power which attacks and the stronger which defends itself, since naval power is proportional to the magnitude of maritime interests. This is just what happened in our struggles with England: she only assumed the offensive against our colonies,

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a coast, they anchored near the shore or ran themselves aground, and disembarked a part of their artillery to defend the two ends of the line. A squadron thus supported was considered to hold a very strong position, and the enemy rarely risked attacking it (see the maneuver of Barrington and of Parker at St. Lucia, and that of Linois at Algeciras). Suffren did not share this opinion. Considering the short range of artillery at that time, it is probable that the effect of such improvised batteries was of a purely moral order. At Aboukir, as is well known, Brueys supported the head of his line with a battery of two mortars and four 12-pounder guns, whose shot did not reach the English ships that doubled the line.

which were all she coveted, after she had defended herself victoriously.*

But when we inquire how this theoretical defensive has been put into effect, we learn that it has led directly to the offensive against the hostile squadrons, the sole means of taking away from the adversary the possibility of doing harm. This sort of defensive is, therefore, of political rather than military order.

Of what then does consist the defensive properly so called, that which furnishes to those who practise it a compensation for their numerical inferiority?

Does it consist of shutting oneself up in harbors, according to a system that has had numerous partisans in recent years?

Such a method of procedure has no connection with any defensive system—it leads simply to inaction. It is only justifiable if it procures advantages for those who make use of it. But what are those advantages?

The force that immobilizes itself inside of a harbor is inevitably blockaded; if the relative situations of blockader and blockaded are examined, it is easy to see that the former has all the advantage. He secures freedom of the seas behind him: according to the English saying, he carries the frontier of his country to the shores of the enemy, and, within this frontier, security is absolute. Therefore, the blockader reaps a positive reward.

The blockaded does no harm to the enemy, and he does not prevent the latter from doing harm; he assures his own existence without safeguarding the interests which he is charged to defend. It is true that he immobilizes forces equal or superior to his own, but what is the good of that when he derives no benefit from it? Therefore, he secures from his inaction only a negative result. Moreover, many will think that it is better not to build the costly and complicated machines called warships, if they are not to be utilized.

* This characteristic of our naval wars is very marked: in the war of the League of Augsburg, the attacks upon our colonies only become serious after the battle of La Hogue; under Louis XV, the taking of Canada and of our East Indian possessions follow the disaster of Quiberon; under the Revolution and Empire, the loss of our last colonies is subsequent to Trafalgar.

We do not speak of the war of the Spanish Succession, because that was one of those in which politics constantly directed operations, and in which the movements of fleets were subordinated to those of armies.

Doubtless there are circumstances under which a naval force is obliged to shut itself up in port to escape from certain destruction; but then it obeys an imperious necessity. In such a case we cannot consider that it has gained the advantages that it should properly derive from a true defensive system. Those who advocate withdrawal within harbors forget that it was forced upon us despite ourselves from 1793 to 1814 and that it never led to anything advantageous except for the enemy; England was anxious only when one of our squadrons became active again by getting out.[84]

Does the defensive consist in the act of devoting oneself exclusively to protecting the coast? Without at present discussing the amount of money and the naval forces that would be necessary to assure directly the defense of the coast, it may be perceived that colonial nations would get only losses from a policy which made that the sole objective of naval warfare. Its immediate consequence would be the abandonment of the high seas to the enemy's enterprises and the stoppage of all maritime commerce. Moreover, admitting the colonies to be strongly enough garrisoned to resist attack (which would require a deployment of forces comporting ill with a defensive system), communications with the mother country would be interrupted and far distant possessions left to their own resources. A situation of this sort could not last long without bringing about disturbances in the economic life of the mother country. But what would put an end to it? The enemy would suffer no damage either in his constituted forces or in his interests; the war would not be a serious burden for him, and he would have every advantage in prolonging it. Moreover, one cannot enter upon a contest wthout possessing any means of putting an end to it by the injury done to one's adversary. Protection of the coast does not furnish this means.

Finally a third defensive system can be envisaged consisting of awaiting the enemy at home in order to utilize all one's resources of whatever nature. If the two belligerents are separated from one another by a wide extent of sea, this kind of defensive is advantageous for the weaker side. It can bring to bear the totality of its

[84] What advantage did the Russians gain by shutting themselves up in Port Arthur? That of delaying the moment when they were obliged to destroy their own ships; but the Japanese availed themselves of it to land in Manchuria.

means of action, while its adversary in going to attack it must deprive himself of all his ships of small radius of action.

Unfortunately, these favorable circumstances never occur in practice. It may happen that two nations separated by wide stretches of sea make war upon one another, but between them are found disputed interests whose possession usually is the object of the strife. Thenceforth, one is no longer free to adopt a defensive attitude; it is necessary to carry the war wherever the enemy carries it; for to defend oneself is not to let oneself be beaten without doing anything.

The Spanish-American war affords us an example of this kind. If Spain had not possessed Cuba and Porto Rico in the neighborhood of the American coast, there would not have been any conflict.[a] When it broke forth, the Spaniards would have had all the more advantage in awaiting the enemy at home, because the American Navy was burdened with coast-defense ships that could not cross the Atlantic; but they were not free to choose their theater of operations, nor to adopt the kind of warfare that suited them. The force of events led them to the other side of the Atlantic. Thus it was the weaker side that had to deprive itself of a part of its forces.[b]

When the two adversaries have common sea frontiers, the weaker no longer has an interest in waiting near his own coast for the enemy, since he no longer can prevent almost the whole of the hostile forces from coming to fight him there. We shall even see, by studying operations in detail, that taking station along the coast, far from compensating for a numerical inferiority, only aggravates it.

In short, the naval defensive, under whatever form it presents itself, offers only disadvantages; one may be obliged to submit to it, but should never seek it. On the one hand as on the other, we are led to assume the offensive, that is, to seek the enemy to fight him. But the two sides do not carry out this purpose in the same way.

The stronger will always rush to meet the different squadrons of the adversary to destroy them as soon as possible, before they

[a] Just as our difficulties with China began after the taking of Cochin China and were kept up by the occupation of Tonkin.

[b] Which proves that one ought not to have several kinds of fighting ships, since it is not known what sort of war one will be obliged to enter upon.

have had time to do harm. The weaker will seek first to make the adversary lose touch with him in order to rearrange his forces and create an unexpected situation; then he will seek to draw his adversary onto a favorable field of battle where his weaker units can be brought into action. So long as this contest lasts, and so long as a decisive battle has not inclined the balance one way or the the other, both sides will abandon the aspirations that brought on the struggle; for it is upon the field of battle that their fate will be decided.

Who will be the victor? The most active, the most skilful, the most tenacious, the one who has the material best suited to the needs of the war.

The offensive will secure decisive results particularly at the beginning of the war. If, by impetuosity of attack, the projects of the adversary are anticipated, a fixed direction is given to the operations; a menace is created which upsets all the enemy's previsions, which paralyzes him so long as he does not succeed in disentangling himself by a victory. But the single fact of having placed him in an unexpected situation puts him in a state of inferiority and prevents him from recovering when, on the contrary, his adversary has himself been able to use his forces to the best advantage.

The characteristic of the offensive is to impose the attack, instead of submitting to it; it has manifested itself in history by the fact that almost all victories have been won on the enemy's coast.

II.

Geography.

Geographical conditions have weighed upon operations in all wars, and, unhappily, they have not been favorable to France.

It is often said that our country, placed astride of two seas, occupies a privileged position. This assertion is correct as far as our economic development is concerned: France has owed to her coast of Provence the predominance she has long exercised in the Mediterranean as well as her African domain, while her ocean shores furnish her with outlets for trade with the two Americas. This cause of prosperity becomes a source of weakness during war: it determines the splitting up of our naval forces into two great bodies, far removed one from the other, and which are unable to unite without passing under the Caudine Forks of Gibraltar.[24]

So long as England had no permanent fleet in the Mediterranean, France was obliged to go to fight her in the Atlantic and the Channel. Every war, therefore, began by the despatch of the forces of Toulon to the north, and geographic conditions constantly interfered with this movement; the distance caused delays or gave the enemy an easy means of opposing the junction.

When the Toulon detachment was slow to arrive, operations had to be begun without it, if circumstances demanded. Thus it was that the Dutch had to fight the Four Days' Battle before the arrival of the Duke of Beaufort, and that Tourville began the battle of La Hogue before he had been reinforced by d'Estrées.

To oppose the junction of our forces, the English proceeded in two different ways: either, profiting by the temporary weakness of our Brest squadron, they took station off Ouessant to await the detachment from Toulon; or they sent superior forces to Gibraltar to intercept it on the way.[25]

[24] The nation which, from the geographic point of view, enjoyed the same advantages as France, without suffering from the inconveniences, was Spain. This was the origin of her greatness.

[25] This second solution is open to criticism: England would have found

Tourville succeeded once in taking eighteen ships into Brest in sight of the English fleet, and Château-Renault, the following year, escaped Killigrew, who pursued him after his exit from the strait.[29]

The danger that these two admirals incurred shows the difficulties of the enterprise, and proves that the operation is of those that logically ought not to be attempted. In fact, Tourville and Château-Renault were the only ones who succeeded and all the other attempts failed; among them that of M. de la Clue, which brought on the disaster of Lagos and had its after-effect at Quiberon.

It must be recognized that the method employed, under Louis XIV and Louis XV, was not of a nature to lessen the disadvantages of an unfavorable geographical situation. The vessels that were sent from Toulon to the north approached the center of English power and ran into danger. It would have been more reasonable to perform the opposite maneuver, and to bring about the junction as far as possible from the principal hostile fleet. This would have required the Brest squadron (the stronger) to start for the south at the period when that of Toulon was accustomed to set forth (that is, a little before the beginning of the compaign, in March or April). It would have passed the straits, joined the Toulon ships, and at once gone north again. The worst that could have happened would have been the English fleet's following it; but it is better to flee from danger than to go to meet it.

During the war that Louis XIV and Charles II sustained against Holland, in 1672, the junction of the French and English squadrons was accomplished in accordance with these principles. The bulk of the English forces was at Chatham with the Duke of York; d'Estrées' thirty ships armed at Brest. The point of concentration was fixed at Saint Helens. Ruyter, who commanded the Dutch, planned to separate the allies by stationing himself in the Strait of Dover. As soon as the Duke of York learned that the

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more advantage in leaving at Gibraltar only frigates to watch the passage, and in concentrating all her forces in the north; she would thus have been more favorably situated whatever happened.

[29] During the war of the Spanish Succession, the English even placed all of their forces at Cape St. Vincent to oppose the contrary operation, the passage of the Count of Toulouse from the north to the south.

Dutch squadron was directing its course from the Texel towards the strait, he hastened to leave the Thames, leaving behind the vessels that had not completed arming, and succeeded thus in getting ahead of Ruyter. The junction was then accomplished without hindrance at the designated place; then the allied fleet, returning to the east, took on the way the ships that had remained in the Thames. The situation would have been entirely different if the Duke of York had remained where he was, waiting for the French contingent.*

During the war of American Independence, each time that the combined fleet cruised in the Channel, the junction was previously accomplished in Spain, sometimes at Ferrol, sometimes at Cadiz, that is to say, far from the enemy's coasts. It is probable that the French government, in adopting this line of conduct, obeyed considerations of a political rather than a strategical order. Whatever the causes were, the result was none the less favorable to the concentration.

The Mediterranean, through the construction of the Suez Canal, came to cut the route of commerce between England, on the one hand, and India and the Far East on the other. Geography would then have turned to our side if, by his foresight, our rival had not known how to reserve to himself the possession of Malta and Gibraltar.

The Mediterranean, in fact, was never a favorable field of battle to the English fleets until the day when they could make use of the ports of Italy, Sardinia and Sicily. Until then, they were too far separated from their base to maintain themselves there permanently; and though England could keep Gibraltar, which is self-defensive, she twice lost Minorca.

In the Anglo-Dutch wars, geography was still favorable to England. All the shores of Holland were watched by a part of those of England, and not a Dutch merchant ship could reach port without traversing the theater of operations. On the other hand, the greater part of the English coast was completely outside of the zone of action of the fleets, and ships could take refuge there while awaiting a favorable opportunity to enter the Thames. The result was that Holland had to interdict all transit while hostilities lasted,

*This maneuver is not mentioned in naval histories; it appears in the report of the Count d'Estrées.

and little by little she ruined herself without having had a marked inferiority at sea.

It seems useless to point out the preponderant part that geography played in the Spanish-American conflict. It is sufficient to look at a map to become aware of it.

In the Russo-Japanese war, geography was doubly against the Russians: 1st, their forces were at the two extremities of the earth when the war broke out; 2d, in the theater of operations, Japan occupied, in relation to Russia's two bases (Port Arthur and Vladivostok), a central position that was favorable to her. This situation enabled the Japanese always to have numerical superiority on the battlefield.

When geography is in one's favor, advantage must be taken of it, but too much must not be made of it. There is, in fact, a tendency to be led astray by the advantages that a geographic position can eventually procure, and thus to come to attribute more importance to this position than to the hostile forces. In a conception of this sort there is a vicious circle. The objective is always the enemy afloat; geographic positions, therefore, have no value in themselves; they have value only in so far as they favor the action of naval forces against the enemy.

To fix our ideas, let us take for example the Strait of Dover, truly the most perfect type of the geographic position. We have, then, stationed at Dunkirk, a powerful flotilla with the avowed object of commanding the passage. But what part can this flotilla play? It will perhaps be less brilliant than one would be tempted to believe.

The operations will have a different character, according as the English coast is hostile or neutral.

In the former case, our flotilla which is based upon Dunkirk and Calais will find itself opposed to a hostile fleet based upon Dover and the mouth of the Thames; and as numbers will not be on our side, it is not very apparent what we could undertake with success. If our torpedo-boats remain cautious and avoid engaging, they will in effect leave the enemy master of the strait. It seems preferable, therefore, to employ them in another region, and they are out of place in the Strait of Dover. It would only be worth while for them to appear there when they had a chance of driving off the hostile flotilla.

In the second case, that is if the English coast is neutral, nothing

will prevent France from *commanding* the passage, and this time at least it might be thought that the presence of a flotilla at Dunkirk was justifiable. But it is not at all so. If the flotilla includes a considerable number of submarines, it will doubtless be a sufficient menace to take away from the enemy the desire of risking himself in the strait; but that does not constitute a positive result. The enemy will be embarrassed in his movements, but he will not suffer any diminution of strength. On the other hand, we shall have immobilized a numerous flotilla with no resulting gain. It cannot be too often repeated that naval forces are made to play an active part. To condemn them to stand stock still, waiting for events that may never happen, is equivalent to giving the enemy a force equal to the one thus withdrawn from the theater of operations. The day when a hostile fleet is seen appearing in the Atlantic, after having passed to the westward of England, it will be recognized that the position of the Strait of Dover has not an absolute value.

None the less geographical positions have an indisputable strategic importance that has been clearly brought out in the Russo-Japanese war; and yet the Japanese never thought of permanently immobilizing forces in Pescadores Channel and the Korean Strait,[a] nor in the Straits of Tsugar and la Pérouse, since these forces would have been wanting in the Yellow Sea. They profited by the advantages that certain of these positions procured under determined circumstances; but they did not seek to make them yield more than they could give.

The preceding considerations do not apply to straits alone; they are true for whole regions. It is evident, for example, that the Channel would be an excellent field of action for our flotillas, which are composed in greater part of units of small size. But we must not let ourselves be so attracted by this advantage as to assign the Channel in advance to our torpedo-boats as a theater of operations; for so long as the enemy did not present himself there they would have nothing to do there.

[a] Some torpedo-boats had Takechiki for base, but they were few in number and could not, on account of their small size, take part in the operations in the Yellow Sea. Their presence in the Korean Strait, moreover, seems to be attributable much less to anxiety to guard the passage (which they were incapable of doing) than to the purpose of aiding the passage of transports through the channel.

In the same order of ideas, the public ought to become convinced that our squadrons are by no means intended to operate in one region rather than in another, in spite of the official designations that seem to assign them specially to the guard of fixed regions. They have been created, at great expense, to destroy the enemy, whatever be the place where he is to be found. If he does not come to them, they must go to him. Besides, where there is no enemy our interests are not threatened, and we do not have to protect them.

III.

Secrecy of Operations.

If there had never been anything unforeseen in the composition and movements of forces, the brilliant combinations that we admire would have been reduced to nothingness, and the great leaders would have been deprived of one of their most powerful means of action.

There do not seem, however, to have been many mysteries in naval wars; and although previsions were often found faulty as a consequence of fortuitous circumstances, we generally knew the English armaments, and the English knew ours. Doubtless it did not enter into the manners of the time to conceal from officers their destination, so that the enemy was informed, not only of the preparations that were made, but also of their object. It is perhaps for this reason that, on all seas, the forces always tended to reach a state of balance so far as the means at the disposal of each side allowed.

Napoleon, on the contrary, always took care to envelop his naval operations in uncertainty. It is known that the secret of the expedition to Egypt was well kept, and that it resulted in the success of his landing. Further on we shall see in what manner the Emperor turned aside the attention of the English government in his great strategic undertaking. The efficacy of the dispositions adopted is proven, since Missiessy was not followed to the Antilles and Nelson lost a month before hastening in pursuit of Villeneuve.

It is almost impossible to conceal the warlike preparations that go on in ports; the enemy will even often have enough perspicacity not to accept without reservation all the rumors which circulate in respect to them, nor to take seriously all the preparations that seem to confirm them. Nevertheless, he will not be able to scorn them and to neglect to take account of them; for his not taking the measures called for by the avowed projects of the enemy would suffice to render their accomplishment possible.

Secrecy of operations gives birth to doubt; and there is no worse counsellor for those who have the responsibility of directing

the movements of fleets than doubt. It often leads to the adoption of a mistaken course and to an ill-advised division of forces. We have already seen examples of this, and the Americans have quite recently furnished a new proof of it: when the Spanish squadron left the Cape de Verde Islands, uncertainty as to its objective led the Navy Department to divide its forces into two groups, neither of which, theoretically, had a marked superiority over the Spanish cruisers. A junction was only effected after it was learned in what region the enemy was to be found.

One's projects, therefore, must never be made known, even those which seem to be a necessity; it is astonishing to see, in reading history, how much the enemy is disposed always to believe in the most complicated solution when he is obliged to divine the objective of an armament.

With the means of communication now available, it seems difficult to deceive the enemy long as to one's movements. Nevertheless, the Japanese, by means of a strict censorship, succeeded in keeping their adversaries in almost absolute ignorance of their movements. It would be premature, therefore, to consider that, on account of the development of telegraphy—with or without wires—secrecy of operations must be renounced.

IV.

Information and Communications.

The object of the service of information is to penetrate the designs of the enemy in spite of the precautions that he takes to conceal them. A thorough knowledge of the adversary in itself furnishes precious indications; history shows what his aspirations are, and the means that he has employed in previous wars to realize them. By combining these data with the economic situation of the country and the ideas that are current there, we bring together a certain number of presumptions which give an impression as to the trend that he will give to operations.

War declared, it is above all important to know the number, composition and movements of the adverse forces.

To this end all governments maintain agents, who keep them informed regarding the warlike preparations of the ports and the rumors that circulate; but all these informations should only be tentatively accepted, since those who furnish them are often not to be depended upon and rarely have an exact understanding of the business. In any event, as agents are actuated by an interested motive, they are much more concerned to furnish information than to see that it is exact, and, to earn their pay, they have a tendency always to exaggerate.

Searching.—When the hostile squadrons put to sea, their destination can be known and their projects opposed only by getting touch of them. The service of information then devolves upon fast vessels; in its modern form it is known under the name of "searching."

Seaching consists of finding the enemy without other datum than his point of departure. The inventors of the process advocate, for the solution of this problem, the use of so-called strategical curves. On paper, these curves give rise to amusing recreations; carried into the field of action, executed by real ships, they give nothing, because, in order to use them, it is necessary to base the strategic problems upon false or conventional data.[42] So that

[42] The difference assumed between the speed of the chaser and that of the chased is too great; the points of departure are nearer together than they

it may well be asked whether strategical curves were brought forth by anxiety to find the enemy, or whether they were not applied to that purpose in order to find a use for them. However this may be, whenever it has become a question of practice, one has inevitably been led to sweeping with a line of cruisers the segments of the sea in which it is supposed that the enemy ought to be found.

For a number of years the application of the principle of searching furnished the theme of all our exercises, without giving very conclusive results. As we contented ourselves with seeking to discover the enemy, without bringing in the data that, in time of war, will limit the uncertainty as to his position, and without taking account of the reaction of the development of cruisers upon the force of the line of battle, everybody said that our squadrons hadn't enough cruisers. And it could not be otherwise, for we aimed at giving an absolute solution to a problem which, in itself, does not admit of one, except in special cases.

Moreover, the importance attributed to this scouting cavalry led to the supposition that the enemy would use the same means, and that before being able to reach the main body of his forces, to ascertain their number and position, it would be necessary to drive back the opposing forces. It is then no longer a light cavalry that should precede squadrons, but a heavy cavalry, armored cruisers; the light ships are no longer good for anything but connecting the scouting line with the command by an uninterrupted service of expresses.

It would only be advantageous to endow our squadrons with a cloud of cruisers, if the consequence of so doing was not to diminish correspondingly the line of battle. Certainly lines of cruisers will furnish means of getting information as to the force of the enemy in time to escape in case of being inferior; this inferiority, however, must not be due to an exaggerated development of auxiliary ships. But, in certain maneuvers, the total tonnage of these latter reached 50 per cent of the tonnage of all the armored ships, and, now that cruisers of 12,500 tons and more have come into service, the total displacement of our so-called light vessels approaches that of the armored ships.

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would be in reality in order to permit solving the problem during the period of daylight; finally the enemy is prohibited from changing course, which seems rather too much.

Whither does this tend?—since, in fact, such a diminution of our effective fighting ships can only be admitted on condition that the elements that weaken them are indispensable. But the design of ships devoted to searching is open to criticism as well as searching itself.

The object of the vessels that attend the squadrons is not to fight; it is to furnish information. The combats that they may have to sustain in the accomplishment of their mission are only accidents; if they are stronger than the enemy, they drive him back; if they are weaker, they withdraw. But it is the idea of making our cruisers fight that has determined the increase of their displacement, with the solicitude always to do better than other nations. The cruiser must thus inevitably approximate more and more to the battleship; which is contrary to reason. Actually our new cruisers are as large as our armored cruisers and their speed is but little greater. It is no doubt difficult to allow that we should have a type of light vessel inferior to that of the enemy; but, on the other hand, the theory of lines of cruisers does not rest on any experimental datum, and nothing proves that, in reality, things will happen according to prediction. It may very well be, on the contrary, that from the beginning of a war, the whole system will crumble, since it has not received the sanction of experience.

Henceforth, in fact, we may expect many disappointments in this quarter. In the exercises of our squadrons, the problem has never been attacked very closely; the greater part of the themes are conceived with a view to assuring a successful conclusion, so as not to risk expending fuel for nothing. In spite of that, the conclusions that can be drawn from our maneuvers are scarcely consoling: the first part of the program, that which consists of discovering the enemy, succeeds sometimes, thanks to rigorous conventions which war will refuse to admit; in revenge, the maintenance of contact and the service of information have always functioned pretty badly. These results are of a nature to awaken our suspicions as to the efficacy of scouting lines.

The services that are demanded of them, moreover, are not obligatory to the same degree upon both sides. The stronger, after having assured itself of numerical superiority, can think of increasing the number of auxiliaries accompanying squadrons in order to enhance its chances of meeting the enemy. The

weaker, on the contrary, will never have any trouble in provoking an encounter; but, in order to risk one, will try to bring about its reinforcement with other units; and, to assemble them, it has nothing to gain by extending the area it covers; it will concentrate, on the contrary, so as to occupy the least space possible."

The number and kind of vessels intended to maintain the service of information and communications ought not to be fixed in an abstract fashion; the way in which the development of auxiliary ships may react upon the general conditions of the war should be taken into account." Give to a chief of squadron the task of seeking another squadron in the midst of the seas, as a needle is looked for in a truss of hay. This admiral, seeing only his immediate objective, will find that he is always lacking in light vessels; double, triple their number, and he will not complain of it. Suppose now that this same chief of squadron commands in time of war, and that upon the result of his encounter with the enemy depend the destinies of the country. At this critical moment his solicitude will not be for light vessels, but for fighting ships. It is those that he will insistently demand. And, if he could be left free to dispose as he saw fit of the tonnage represented by the whole of the so-called light vessels, there are nine chances out of ten that he would change the greater part of them into solid battleships, because there is never too much force to insure victory. This admiral will without doubt consider that, before thinking of meeting the enemy, it is first necessary to be able to contend with him, and that there is no instance of adversaries not having ended by meeting."

" If, during the maneuvers of 1901, Squadron B had not deployed its cruisers, it would have had a better chance of slipping through.

" "If my heart were opened," wrote Nelson when he was searching for Brueys' squadron, "there would be found written on it 'more frigates.'" Without doubt he was right. But if the Admiralty had replaced ships by frigates, there could have been read in Nelson's heart "more fighting ships."

" Let us inquire what have really been the determining causes of naval battles. They can be arranged in two classes. The first comprises all actions where the adversaries have deliberately gone to meet one another to decide to which the empire of the sea shall belong. In this category belong the battles known under the following names: Lowestoft, the Four Days' Battle, North Foreland, Solebay, Schoneveldt, Beachy Head, Malaga, Ouessant.* The second category comprises battles that were the conse-

* This is the French name for Keppel's action off Brest in 1778.—P.R.A.

He will, therefore, keep only the indispensable number of scouts, and these, representing but a small part of the tonnage of the whole squadron, will not materially diminish his strength. In a word, he will adopt the solution that will give him the best return."

We are thus led to consider how information was obtained at the period when the seas were not raked with cruisers.

At the very start we are struck by the quantity of news furnished by neutral vessels [a] and by prizes taken from the enemy.

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quence of operations undertaken by one of the belligerents and which the other attempted to obstruct: Stromboli, Agosta and Palermo are connected with the French occupation of Sicily; Bantry was the result of a landing in Ireland; La Hogue of a threat to invade England; Mahon of the siege of that city; Quiberon is merely a repetition of La Hogue.

Almost all the encounters of the war of American Independence in the West Indies and on the American coast had their origin in land operations; the same is true of part of Suffren's battles; finally Trafalgar is the last act of the attempt to land in England.

Steam does not alter the character of encounters; Lissa, the Yalu and Santiago have a certain likeness to Bantry.

As for accidental meetings, they are in a very small minority, and should be put down to the account of the profit and loss of war.

"The increase of the size and armament of cruisers will lead to their being regarded as ships of the line. Thus we shall have poor fighting ships that we shall not even be sure of bringing into action, for they may very well be at a great distance from the main body at the moment of encountering the enemy.

[a] *Examples.*—A neutral vessel informs the Spaniards of the departure of Derby with a convoy for Gibraltar (1781); Derby himself is advised by a neutral of the capture by La Motte-Picquet of the convoy from St. Eustatius and detaches eight ships to try to retake it (1781). Madeira fishermen inform Suffren of the passage of Johnstone; the latter was steering for the Cape of Good Hope when he learned from a neutral of the preparations that made his expedition useless (1781). A merchant ship informs Suffren of the whereabouts of the East Indian English squadron (1782). Lord Howe meets neutrals, who inform him of Villaret-Joyeuse's position (1794). During the voyage of the expedition to Egypt, a brig meets Nelson's squadron at sea and carries the news to Toulon, whence two despatch vessels are hastened to Brueys (1798). On June 22, the English speak a vessel that had passed through the midst of Brueys' fleet (1798). Bridport learns from several merchant ships that Brueys' fleet, set out from Brest, is proceeding to the southwest (1799). A Ragusan vessel informs Villeneuve that Nelson is to the southward of Sardinia (1805). The latter learns, in his turn, that Villeneuve was south of Cape Gata on March 7, etc.

The squadron that gets news communicates it, if it is necessary, to other squadrons and to the seat of government. The latter, for its part, sends to the squadrons all the information that is of a nature to interest them. Thus there is established between the squadrons and the shore, and between the squadrons themselves, a permanent exchange of communications by means of light vessels.[48] All the news that reaches the chiefs of squadrons only furnishes them with indications from which they judge what is probable. Then they send scouts in fixed directions to see if their conclusions are well-founded.

This system of communications was not created outright, as ours is. It was the result of the experience of centuries, and nothing proves that the needs to which it responded are not as exacting to-day as they used to be. It is not practised during maneuvers and exercises because the very statement of the theme takes its place; but in time of war it is very possible that we shall be obliged to re-establish it suddenly. We shall then find ourselves stripped of light vessels because, on the one hand, the practice of searching has given the auxiliary divisions a composition not at all suited to this kind of service, and, on the other hand, there is no sign of a provision of scouts distributed in all ports for the use of the central government. In the old navy, the despatch-boats were little vessels (frigates, corvettes, brigs), whose small cost permitted an increase of number without diminishing too

[48] *Examples.*—D'Estaing sends the *Flore* to the Spanish coast to keep the minister informed regarding his position (1778). The frigate *Concorde* learns at Martinique the news of the declaration of war (1778). The corvette *Diligente* carries to France the news of the taking of Grenada and the battle of July 6 (1779). De Ternay sends a vessel to France to ask for reinforcements (1780). De Grasse asks Barras to send him despatch vessels with Rochambeau's despatches (1781). The *Fine* carries to Mauritius and the Cape the plans of the government (1781). The *Consolante* goes to the Cape to give Suffren the order to return to Mauritius (1781). Suffren sends a ship to France to announce the battle of Praya (1781). The *Argus* goes to Europe to carry the news of the departure of the Count d'Orves (1781). Hotham is warned by an express from Genoa of the sortie of Admiral Martin (1795). The *Curieux*, sent by Nelson to Europe, meets Villeneuve's fleet (1805). The *Aréthuse* meets two French divisions at sea; she sends a despatch boat to Cornwallis, a corvette to Ferrol and to Cadiz to warn the English fleets (1805). Admiral Duckworth sends a frigate to England to carry information to the Admiralty as to the strength and course of a French squadron he has met (1805).

much the effective force of ships of the line. These vessels were distributed in all the ports so as to be always sure of being able to send one of them from a region not watched by the enemy; if the news to be communicated was very important, two or three were sent at the same time from different places. The messengers coming from the squadrons, for their part, took care not to make the land in quarters where the enemy was cruising, and they entered by preference commercial ports.

If the modern navy has to undertake the same service, it will have only big cruisers to do it with; it would need a swarm of scouts of 900 to 1000 tons, which will have the advantage of being numerous without costing much, and under very many circumstances simple torpedo-boat destroyers will suffice for this task by virtue of their great speed.

If, moreover, we refer back to the three last naval wars—the Chinese-Japanese, the Spanish-American and the Russo-Japanese wars—we find no evidence that they could have furnished occasion for the employment of searching. In the first, the Japanese had no need whatever to play with search rakes in order to obtain knowledge of the enemy's force and position. In the second, scouting lines would have proved themselves manifestly powerless to discover in the midst of the Atlantic the Spanish division, set out from the Cape de Verde Islands with an unknown destination. Had the Americans transformed their entire fleet into scouts, to the extent of having not one fighting ship to oppose to Admiral Cervera, their search rake would have covered an insignificant part of the surface of the sea. It must be admitted that there are occasions, on land as well as on the sea, when, to know where the enemy is, it is necessary to wait for him to show himself, which usually is not long delayed. Above all, it is necessary to avoid losing precious time and dispersing without any gain at all no less precious ships, for the pleasure of doing kinematics. Finally, in the third war, we know very well the use that was made or could have been made of light vessels; but it surely was not in the conventional shape that we have created.

Is this to say that it will never be necessary to have recourse to scouting lines? Not at all; but, instead of using them regularly, as we now do, they will only be used in special cases, and during short intervals of time, when operations are undertaken in very narrow seas such as make them perfectly efficient. But it will not

be necessary to depend upon vessels specially built for this service; it will be enough to collect for the occasion all the light vessels available in the region and to suspend, while the operations last, communications with the shore and between squadrons.

As to encounter between cruisers thrown out ahead by each side —as to this encounter the contingency of which has given us armored cruisers—it has not yet taken place, despite three successive wars. From which we may be permitted without presumption to infer that a general conclusion has been lightly drawn from what will never be anything but an exceptional case.

It may be asked what influence the nets of telegraph wires that cover the earth will have upon the service of information. Judging from the Spanish-American war, the advantages of instantaneous communications have been tempered by some drawbacks. Cruisers have derived an evident benefit from them by going to the end of a cable, instead of traversing great distances; on the other hand, the American government was overwhelmed with the most contradictory news.

In any event, the cutting of cables must be anticipated and its consequences prepared for.

Scouting.—It is not considered sufficient to send out cruisers ahead of squadrons to discover the enemy; it is also proposed that naval forces should have in their immediate vicinity a screen of sentinels to preserve them from any surprise. At first, scouting in cross was tried, which is still the regulation method; then it was agreed that polygonal scouting was preferable, which assures an equal protection in all directions if the fighting body is allowed to fall back to the rear of the center of figure in relation to the direction of advance.

Without wishing to undervalue the merits of tactical scouting, even were it hexagonal, it may be said that it derives from an idea that is more seductive than practical.

Supposing the main force to be 12 miles from the furthest scout (which is a maximum) and a velocity of approach of 24 knots (which is a minimum speed of 12 knots), the safety interval is increased by half an hour.

Five or six scouts cannot be immobilized for this scant benefit. It would be dangerous to substitute battle-ships for them; they might not have time to concentrate, if they were surprised by an enemy breaking through at full speed. Only convoys remain,

therefore, to which to apply close scouting, and their ships do not possess sufficient means of communication to perform this service.

Usually, it will be known when the enemy is near and there is a chance of meeting him. Then a more sustained watchfulness will take the place of scouting.

Chasing.—Since cruisers entered into the composition of squadrons, problems of chasing have developed so that, with searching, they seem to be the embodiment of naval war. Here we have a new proof of the exaggerated importance attributed to the accessory in derogation of the principal.

Certainly chasing will render real service; but it will perhaps not be in the form that is given to it. Much ingenuity has been exercised to find in it an excuse for solving triangles; in order to give it this trigonometrical form, it has been necessary to attribute absolute values to unknown quantities, such as the course, the speed and sometimes even the position of the chased. These precautions being still insufficient, there has been added, for the chased, the obligation of conforming to strict rules which it is his most elementary duty not to follow.

The day when these peaceful distractions are changed to operations of war, sines and cosines will be obliged to give way to clear-sightedness and resolution. Would it not be better to develop these qualities in times of peace, instead of substituting geometrical constructions for them?

When a conflict shall have brutally brought us to the true concept of naval war, there will be good cause for astonishment that we have been able thus to substitute fictions for reality.

The different methods studied for the solution of problems of chasing find their application in the stationing of scouts among themselves or with respect to the squadron; all the data are then known and furnish an exact point of departure. But strategy is not concerned with this, nor even is tactics; these methods are simply useful in cruising, just as the determination of the position is; they ought, therefore, to form part of the general instruction of young officers.

V.

Bases of Operations.

It is useless to define a base of operations: the necessity is self-evident of having sheltered places in which to prepare forces before they are sent out to fight, to repair and resupply them after battle. But the number, position and utilization of these bases give rise to differences of opinion.

The first condition that advanced bases ought to fulfil is to suffice to themselves, that is not to require the assistance of mobile forces. If bases of operations are made to protect ships, ships cannot have the protection of bases of operations for their objective. The English have always regarded them in this light, and events have proved that they are right: the Admiralty was never solicitous about the attacks upon Gibraltar after that place had once been put in a state of defense; they abandoned the garrison to itself, contenting themselves with revictualing it from time to time. The Russians adopted exactly the opposite solution at Port Arthur; and what it cost them to sacrifice the armament of their fleet to the defense of Port Arthur is well known.

The more advanced bases a country puts at the disposition of its fleets, the greater the development that strategy can attain. Therefore, there would be advantage in multiplying them, if the financial sacrifices that they necessitate (as much for their creation as for the normal functioning of their services) did not diminish correspondingly the power of the active forces for which they are created. Their number is, therefore, limited.[*]

There is general agreement in locating bases only in positions that have a strategic value, but there is more difficulty in arriving at a common understanding as to what constitutes the strategic value of a given point. Certain minds readily allow themselves to be attracted by the facilities that some places offer for the establishment of a great naval arsenal, and they are inclined to believe that this fact alone gives to such ports strategical importance. Then it

[*] Still there must be some. It is not easy to see how the ships on our foreign stations can carry on war so long as they do not have, on each station, at least one port where they can find safety.

is desired to transform the lake of Berre into a second Bizerta; and radicals even go so far as to wish to utilize the sea of Bou-Grara. The sole advantage of these two lakes resides in the enclosed sheet of water, "which would suffice to give shelter to all the fleets of the world." This phrase, which we have all heard applied to Brest, Rio de Janeiro, Bizerta and Diégo-Suarez, has the gift of producing a profound impression on the public.

The excessive dimensions of a roadstead are, nevertheless, an inconvenience rather than an advantage, and it is absolutely useless to be able to shelter a thousand ships in a place where the necessities of war will never bring more than fifty. If the roadstead of Brest were less vast, the inner defense would have been easier to organize, and the need of a breakwater would not have been felt at all; it is the extent of the lake of Bizerta similarly that has necessitated the construction of a small harbor inside the big one. The importance of these roadsteads, therefore, consists much less in the extent of their liquid surface than in the distance that separates them from the sea, a distance which places their establishments out of reach of shot.

The strategical value of advanced bases really depends only upon their geographic position.

The utilization of bases of operations is a complex problem that presents itself in a different light in each region, according to the conditions peculiar to each of them. It will be sufficient for us to seek out the part that some of them have played in the past, and that which they can have in the future, to show that the services they render are not all of the same order.

Brest and Cherbourg threaten directly the shores of England, and Toulon was built to command the Mediterranean. It seems, therefore, that the first two ports would serve as points of concentration for forces intended to operate in the Channel, and that the squadrons that are to act in the Mediterranean would be drawn from Toulon. Yet we have seen that the immense fleet which, under Villeneuve's orders, imperiled English supremacy in the Channel, was drawn entirely from Toulon, Cadiz and Ferrol, while the Brest squadron played no part in it. On the other hand, when Bruix found himself in the Mediterranean at the head of forces double those of the English, it was Brest that had furnished the greater part of his force. Later, the First Consul, wishing to send help to Egypt, had the forces destined for this expedition set out from Brest (Ganteaume's cruise).

These anomalies are easily explained. The menace constituted by the presence of naval forces in Brest was too evident for the English not to take acount of it by stationing in their neighborhood equal or superior forces; and the proximity of her coast gave her every facility in this respect, for, if Brest commands the English coast, Portsmouth commands the French coast. To secure superiority, therefore, it was necessary to draw from out-of-the-way regions supplementary forces, which, from their remoteness, might have other objectives and consequently not inspire the same apprehensions in the enemy.

Toulon was not, like Brest, paralyzed by a hostile port, and would perhaps have sufficed to the Mediterranean forces with its own resources if our rivals had not had the foresight to secure provisional advanced bases that compensated, in a certain measure, for the distance of their great military ports.

So long as a battle does not intervene, the absolute benefit of bases that command a coast or a region is acquired only by the stronger side which in advance concentrates there the forces that it judges necessary. But it is only after a victory that, on one side as well as on the other, the strategical importance of such bases makes itself specially felt. The victor, master of the sea, establishes himself there permanently and finds, in the resources that they afford, means of resupplying his squadrons without separating himself from his field of action. The importance of a point must, therefore, not be deduced from the number of ships that are there at the beginning of hostilities, but from the forces that the progress of operations may bring there; for, soon or late, the interest of the war will concentrate itself in regions that may be called centers of attraction.

Rochefort and Lorient.—The advantages of these ports during our naval wars arose from a double cause: the importance of Brest, where the principal armaments took place, drew from them the attention of the English; at the same time their distance from the enemy's coasts made their surveillance more difficult. That is why it was always endeavored to make the reliefs destined for the colonies and, in general, small expeditions intended to operate in the Atlantic start from these ports. It is to be observed that the divisions of Missiessy, of Allemand and of Savary, which were almost the only ones able to go and come without hindrance, had Rochefort for base. And their success must be attributed to the difficulty the enemy had in watching that port.

Secondary bases, therefore, advantageously supplement the principal bases, without taking away from the latter their importance, and without making them lose anything of their own proper value.

The suppression of secondary bases simplifies the task of the enemy by permitting him to watch with a single force the different fractions that are not called upon to act together.

However, it is evident that from the moment that our military ports of the second class have become unequal to receiving existing squadrons, whose units are of not less than 12,500 tons displacement, they cease to constitute bases and no longer render any service. This, unhappily, is the case with Rochefort and Lorient.

Gibraltar has not always had the importance that is now given to it. Its true efficaciousness only dates from the wars of the Revolution, that is from the period when the English maintained permanent squadrons in the Mediterranean. Even then the rock was only a post for news, coupled with a rather poor anchorage; ships did not even find water there, but had to go to Tetuan or Lagos for it. The immense works undertaken in later years have been necessary to make Gibraltar a real base of operations.

Before 1793 the Mediterranean only formed part of the theater of war intermittently, and, in the interludes, the fortress was sometimes a heavy burden; it no longer rendered any service, and it was none the less necessary to revictual it by passing through the Spanish forces stationed at Cadiz.

Malta is, for the English, the key of the Mediterranean. The entrance to this sea is closed by Gibraltar, but we are already inside. Without Malta, Egypt and Cyprus are in danger, the mouth of the Suez Canal is at our mercy; and, if an action were to take place east of Bizerta, we would be able to bring to it all our forces, while the English, if they had only Gibraltar, would be deprived of their torpedo-boats.

Bizerta.—The creation of Bizerta was necessary for France on several accounts.

First of all, a look at the chart will make it unnecessary to dwell upon the advantage that could be derived from this arsenal after a victory in the Mediterranean.

In the second place, the need of Bizerta arises from the great extent of coast that we possess in Africa. From Cape Bon to Nemours our shores border upon the route between Gibraltar and Malta; war must, therefore, inevitably lead us into these regions.

We had no means of revictualing there because all the ports of Algeria are directly on the coast; Bizerta fills this want.

Finally, the possession of but one arsenal in so vast a sea as the Mediterranean placed our forces in a difficult position; since, as one of our admirals said, it is almost impossible to imagine strategical operations when there is only a single base at one's disposition.

* * *

There are three kinds of bases of operations:

1st. Arsenals, which are ports of construction, arming and repair.

2d. Advanced bases, where ships find fuel and supplies and where they can make slight repairs.

3d. Stations for torpedo-boats.

Whichever they may be, these different bases are too intimately connected with the utilization of our active forces not to be rendered inviolable, and this condition will be the easier to fulfill if they are at the end of long narrow passages.

Nevertheless, it is not needful to consider the situation of Cherbourg desperate. That port is directly on the coast, it is true; but in consequence of this it has been defended. It is customary to consider that the enemy can easily bombard it. But will the three hundred heavy guns of the water batteries remain silent? Will not the torpedo-boats and submarines issue forth?

The protection of torpedo-boat stations cannot be developed to the same extent as that of the fleet's grand bases. Their best defense will consist of placing them in ports extending well into the land, difficult of access and inaccessible to vessels of greater draft than torpedo-boats. Boom defenses, defended by light artillery, will suffice to preserve them from the enemy's enterprises.

It has rarely happened that ships have dared to attack directly the defenses of a naval arsenal. Still, in the sixteenth century, the English succeeded in reaching a Spanish fleet inside the roadstead of Cadiz, and the Dutch, in the following century, burned some disarmed English ships at Chatham. The only conclusion that can be drawn from these isolated facts is that the defense of the places named was insufficient; for no attempt has ever been made to pass through the narrow entrance of Brest. If the imprudence is committed of stationing ships in bases before they are supplied with sufficient means of defense, the bases become points of weakness.

VI.

The Radius of Action.

If circles are drawn with the bases of operations as centers and half the steaming distance of the ships as radius, the sectors of sea contained in the circles will represent the maximum field of action of the mobile forces starting from each port.

When the radius of action is very small, these various sectors will cover but an insignificant part of the surface of the sea; they are isolated from each other and even may not touch the territorial waters of the enemy. There is no strategy then; the ships are riveted to their base by a chain which fetters their movements, and, outside of their zone, the sea is free; the war does not reach it. If the enemy, better equipped, has given his ships a sufficient radius of action, he has full leisure to assemble his forces and to attack a single sector, sure of having nothing to fear from the others. Thus the side which has the least mobility is inevitably condemned to inferiority on the field of battle, even if it has absolute superiority.

Now let the radius of action be increased. The sectors will extend to the neighboring bases, and immediately the situation is bettered. A squadron, starting from one base, can end at another, or separated squadrons can unite. The number of combinations increases and also the possibility of surprises. The enemy is no longer so free from anxiety; if he makes a given force his objective, he is in danger of being taken in the rear and, to protect himself, he divides his forces.

Finally, if we assume a very great radius of action, strategy attains its full development; the enemy is everywhere accessible and all the movements of forces that the circumstances demand can be put into effect.

The first supposition that we have made is not an imaginary one. It corresponds still to-day to a reality as far as a part of our naval forces are concerned.

We have coast-defense vessels which cannot go from Toulon to Brest, even at moderate speed, without renewing their coal supply. If the interest of the war is transferred far from their base, we

shall have to do without their aid. But, it will be said, they have been put there to remain there. There are necessities from which there is no escape; did not Admiral Nebogatof's coast-defense ships, which were built for the Baltic, go to the shores of Japan to be sunk?

Let us now inquire what the situation of our foreign possessions is. Actually, the ships stationed in them can find support only in their single base. Unless they shut themselves up in it (in which case they are of no use) they will be destroyed sooner or later. The enemy, knowing their number and isolation, will oppose to them superior forces and will always succeed in meeting them, because they will only be able to move in a restricted zone and because, for this reason, their objectives will be limited; the enemy will know, besides, that through unavoidable necessity these ships must return to their point of departure, and he will await them in its vicinity.

If these same ships had a sufficient radius of action to be able, from their central station, easily to reach the neighboring stations and to go, for example, from Dakar to Martinique and to Diégo-Suarez, or from Diégo-Suarez to Saigon and to Dakar, the military value of our foreign stations would cease to be a negligible quantity. The forces of two or three stations could unite at a single one, find themselves thus momentarily superior to the hostile forces and crush them. Instead of shutting themselves up in a trap, which amounts to moral defeat, they could assume the offensive and play the only part that becomes fighting ships: wage war. It will doubtless be pointed out that hundreds and thousands of miles will have to be covered in pursuit of an uncertain result; but war is not a child's game and nothing is won without cost. It is possible that fruitless raids will be made; yet perseverance has always been compensated, and a good victory quickly effaces the memory of past trials. Calculate from the chart the number of leagues traversed by Nelson before coming up to Brueys at Aboukir and Villeneuve at Trafalgar, and take account of the effort he must have made to reach the enemy; and if Nelson had survived his last victory, perhaps he would have felt that he had not bought it too dearly by paying for it seven months of pursuit.

The small importance that for a long time has been attached to the radius of action was the consequence of the transformation of naval material. The appearance of steam completely changed the

strategical conditions of naval warfare; and, while giving the ship freedom of movement, imprisoned it in a narrow circle. Military operations were then seen under a new aspect, and in the presence of the facts, the value of the distance that could be traversed was lost sight of little by little. Thus for a long time no advantage was taken of improvements in the economy of engines; the old ways were followed, because mental conceptions are always behind material progress. It is only in these latter years that more correct ideas have led to increasing the radius of action of our ships, but the error committed brought us a fleet of coast-defense vessels that are unsuitable for carrying on war. Yet there were numerous examples of enterprises that had to be interrupted or failed on account of the necessity of returning to port.[80]

As to the advantages secured by a greater radius of action than the enemy's, they were particularly evident during the wars of the Revolution and Empire. At this period, the English had to a considerable degree increased the independence of their squadrons by introducing the use of iron water tanks on board ship and bettering the health of the crews by measures of cleanliness unknown till then. At the same time, the constant training given to the sailors had diminished the damages that so often obliged ships to return to port; so that Nelson could say that his ships were less tried by bad weather in a year than ours were in a day. It was due to these improvements and this training that the English were able to keep up a continuous blockade of our coasts, which had never before been attempted, and to make those gigantic raids which would have been impossible in the previous wars.[81] They thus secured an absolute advantage. But to-day the elements of the radius of action are altered: they no longer depend on the sanitary

[80] One of those which best bring clearly out the consequences that disregard of this strategic factor may entail is the campaign that the combined fleets of France and Spain made on the coast of England, during the summer of 1779, under d'Orvillier's command, and which failed miserably because the ships could remain at sea no longer.

[81] The radius of action of sailing ships was not as great as is thought, even though it was independent of a motor. In going to the East Indies, the English put in at Brazil, at the Cape of Good Hope (or at St. Helena before the seizure of the Cape) and in the Portuguese possessions in the Indian Ocean. To-day the *Powerful* can go from England to Mauritius without coaling. Squadrons of steamers, therefore, can cover a greater distance than could the old fleets of sailing ships to which an "infinite" radius of action is often ascribed.

condition on board ship, but on the quantity of coal that can be burned; they thus have a direct effect upon displacements, which constantly increase, and an indirect effect upon the number of units, which diminishes proportionally as displacement increases. Still, it can be said that the radius of action, facilitating the utilization of all available forces, compensates to a certain degree for the reduction of numbers that its development entails.

The limit that the development of the radius of action ought to attain is quite difficult to determine precisely. Some officers think that it is fixed by the distance that separates the different bases of operations. War, however, does not consist of going from one point to another by the shortest road. It is necessary to go wherever the enemy is, to expend coal in goings and comings, in a word to use that continuity of action that characterizes successful enterprises. It must not be necessary to stop to take coal at the moment when the objective is reached. The radius of action ought not to be calculated too nicely; it can only be deduced from the general lines of the plan of campaign that it is proposed to adopt.

The influence of the radius of action on the progression of displacements has developed in the French Navy a current opinion opposed to expansion of the steaming distance. Fuel being a renewable element, it has been thought that it could be taken on board in smaller quantity on condition of more often filling the empty bunkers. It is not the same thing, however, to traverse a given distance at one stretch and in several successive ones. In the latter case, there results a great loss of time, and perhaps also the necessity of going out of one's way.

In naval operations, the steaming distance represents the factor "movement." Movement is the soul of strategy, that which gives it life. Without the faculty of moving about, all is arranged in advance, events follow their natural course, the stronger is the victor, the weaker is vanquished. With the aid of movements of forces, on the contrary, the parts may be reversed; the material afloat is made to give the maximum return, it is multiplied. Whether the field of battle be accepted or imposed, it is first of all important to bring the greatest possible number of ships there: movement. Finally, the most direct benefit that victory procures is to permit abandoning an adversary reduced to impotency in order to go to another field: movement.

A tactical unit, however powerful, will never render any but feeble services if it is not capable of moving about freely. The

enemy will be satisfied to keep out of its way. Without going back to coast-defense vessels, regard mobile defenses: if our squadrons were sure of having always with them a swarm of torpedo-boats, their force would be sensibly increased; but this certitude is lacking because those boats have very little endurance, are frequently incapacitated by bad weather, and finally because it cannot be foreseen where and when the enemy will be encountered.[88] If some day we are astonished at the small results obtained from torpedo-boats, we shall have to attribute it in great part to their want of mobility. This shows that tactics and strategy are indissolubly connected: one is good for nothing without the other.

A naval force, devoid of radius of action, is exclusively defensive. It may thwart the enemy's plans, but it will never endanger him. It contributes nothing, therefore, towards the ends of the war; it has a negative efficiency. It may be redoubtable, but its power is fettered: it is a lion enclosed in a cage. Interdicting access to such or such a point does not better one's situation; what is needed is to prevent the enemy from being safe wherever he may be. The defensive is passive; the offensive is active. But the latter is inconceivable without movement.

Evidently nations that build ships without steaming endurance have good hopes of being able to make use of them; they suppose that war will take a form appropriate to their employment. They thus prepare for themselves many disappointments, for, with this plan, it is necessary to reckon with the enemy, who will always find means of being superior in force and in number if he has only passive forces to fear. War does not divide itself up into a series of particular cases; it comprises only one general case which is to go wherever there is need of being.

After the example that Spain, the United States and Russia have just given us, mobility cannot be thought lightly of. Neither of these three nations was capable of making the whole of its forces take part in operations, because part of them was incapable of changing its place.

* * *

Fuel is not the only constituent of the radius of action. That is what is generally referred to; but there is another factor which cannot be neglected: that is the supply of munitions.

[88] Sea-going qualities have a place among the factors of the radius of action of torpedo-boats.

A naval force whose coal bunkers are full while its ammunition rooms are empty is none the less powerless.[88]

In estimates of a ship's radius of action, the supply of ammunition is the necessary condition, and the quantity of coal is the sufficient condition, because the object of the second factor is to enhance the first.

[88] When the Japanese squadron abandoned the battlefield of the Yalu, in want of ammunition, it lacked radius of action. It was the same with the American division that fought the battle of Cavite: the destruction of the Spanish fleet was succeeded by a long period of inaction occasioned by lack of shell. If the Spaniards had had other forces in the Philippines, the Americans would have been obliged to leave the islands.

VII.

Speed.

The advantages secured by speed, in the old navy, stand out clearly in the following report of Suffren, in which he asks that our ships be copper-bottomed so as to be able to cope with those of the English:

"Since the English have coppered a number of their ships and continue to do so with such activity that they will all be copper-sheathed in a short time, the operation of sheathing ours ought not to be regarded merely as advantageous; it is an absolute necessity. Otherwise, when they are the stronger, they will be sure of coming up with us, and when they are the weaker, avoiding us. . . . .

"In Admiral Rodney's reports may be seen with what confidence he sends three ships into the Mediterranean, with what temerity he has them cruise off Port Royal, where we had twenty-five. But for the sheathed ships, in view of the approach of night and bad weather, Langara might have escaped; if the *Prothée* had been sheathed, she would not have been taken. These reflections, which a seaman cannot avoid making, have deeply affected me, seeing escape the escort of the convoy just taken by the combined fleet. If the *Zélé* had been sheathed, she would have come up with the *Ramillies* and attacked her. In a previous cruise, I would have taken five privateers that I had chased, and a very rich convoy going from London to Lisbon, which I missed because of having chased for sixteen hours a privateer, which separated me twenty-five leagues from the cruising ground that I had established from Cape La Roque to the Scilly Islands. Finally, the boldness with which Commodore Johnstone cruises with a fifty-gun ship and some frigates, encompassed by fifty ships of war, is a very strong proof of what I have just stated."

All these considerations are still true. The advantages of speed can be summed up as follows:

Inferiority of speed in relation to the enemy compromises all operations; it renders the offensive almost impossible, without profiting the defensive.

Superiority of speed diminishes the dead time that separates conception from execution; it favors surprises.

The influence of speed manifests itself likewise in that it gives to the commander greater freedom of mind and of movement, on account of diminution of the danger that results from the neighborhood of a superior force.

Every effort will, therefore, be made to be faster than the enemy, but just here comes in the difficulty. No one power possesses the secret of building ships faster than those of its neighbor; and, for this reason, among the great maritime nations, the speeds of each class of ships are sensibly equal. If a navy aims at superiority, its lead lasts but a short time and affects only so limited a number of ships that it is not worth being concerned about.[84]

Moreover, supernatural virtues must not be ascribed to speed. Its admirers draw up for us an attractive list of its qualities: "If we are faster than the enemy, we can force him to fight when and where we wish." Things do not come to pass so simply. Doubtless it is possible to draw the enemy to oneself by occupying a region where he has interests to safeguard; but when he is there the encounter will take place when and where it can, and not when and where one would like it to be. Speed will certainly be useful; but what good purpose will it have served if, in order to arrive first upon the battlefield, we have had to throw overboard part of the artillery to increase our headway. Yet this is the result arrived at by seeking superiority of speed at any cost. To be convinced of it, it is sufficient to compare the armaments of two ships of the same displacement and of different speeds.

There is nothing left to do then but to escape, and the natural conclusion is that it would have been better not to come. Flight is not a solution; it is an avoidance.

When speed is at the service of weakness, it merely facilitates desertion. During the Russo-Japanese war, the Russian cruisers furnished us, on three different occasions, with valuable indications: let us take care not to forget them.

It will not be easy even to play the part of the Wandering Jew on the sea. We are preparing for ourselves a terrible awakening

[84] According to official figures, the English destroyers are faster than ours; but accidents have shown that their excess of speed was only obtained by the sacrifice of qualities essential in vessels; it would, therefore, be an embarrassment rather than an advantage.

when we figure that a superiority of two or three knots will permit escaping. It may be supposed that a ship which constantly keeps all fires lighted and all boilers under pressure will be able to escape every attack, thanks to her speed, if she has nothing else to do but take to her heels as soon as smoke is seen on the horizon. But all this is pure theory. In practice no warship is capable of keeping, through the whole duration of a cruise, her boilers at 17 atmospheres' pressure; and before taking flight it is needful first to recognize with whom one has to deal. Thus it will be necessary to let oneself be approached, and when it is decided to run away, the situation will already be critical. To escape from it, the ship will have to undergo one of those tests that are so often interrupted by breakdowns during official trials. Mere statistics will show the danger of trusting to speed under these excessive conditions.

Doubtless the chaser may also suffer the same injuries, but for him they will not have the same consequences; they will not entail his loss. The situation is not the same, therefore.

If, instead of considering the case of a single ship, we take that of a group of vessels, we arrive at still more pessimistic conclusions. Homogeneity of speed is most difficult to obtain; ships have a speed depending upon their age, the cleanness of their hulls, the amount of scale in their boilers, etc. At the present time, when the speed of battle-ships closely presses that of cruisers, a squadron of battle-ships has units faster than the poor sailers of a division of cruisers. Thenceforth, the latter can no longer escape without abandoning to the enemy some of its ships; the laggards will be quickly caught by the fast battle-ships; and to succor them it will be necessary to make a stand.

All this proves that the advantages of speed are much more sensible for the stronger side, which derives an absolute benefit from it, than for the weaker side, which will make use of it, but which only has an interest in seeking after it if not thereby weakened. But, until a new invention permits getting greater power on a less weight, speed will only be increased by increasing the power of the engines and the number of boilers to the detriment of armament. In this way we fall again into the error committed at the time when battery power was increased by making monster guns, and the protection of ships by giving them armor of greater thickness. In the first case, the armament was reduced

to one or two big guns; in the second, the armor sheltered but a slender battery.

The result, therefore, is that the weakest navy is reduced to not letting itself be left behind, and to seeking preferably endurance, which, with theoretically equal speeds, gives in fact superiority. This necessity is all the more imperative because speed is so excessively costly; not only will a fast ship be less armed on an equal displacement, but she will likewise cost more, since battleships cost about 2200 francs a ton, while light vessels without any protection come to about 3000 francs a ton. Speed, therefore, weakens in two ways: it diminishes the armament of ships as well as their number. Nevertheless, to-day, one can no longer discuss speed under its different aspects without being accused of the crime of lack of patriotism. By dint of exalting it, we have come to deify it. It is no longer considered in its relationship to other elements; it is made a thing apart, intangible, which has value in itself. Let us not fear, on the contrary, to cry aloud (at the risk of being regarded as retrogressives) that speed is not a force, but a means of giving value to force, and that one has no right to sacrifice a single gun to it. That is the truth.

* * *

The speed corresponding to the most rapid pace that can be kept up indefinitely is called the "strategical speed." We seamen have no concern with those trial speeds that are reached by forcing a ship over the measured base like a race horse in the home stretch. Such feats require an expenditure of energy and a supplementary personnel that cannot be furnished in regular service. What we need is to keep up without failure a sustained rate of speed, that is to have engines that are not liable to break down.

High speed demands the presence in engine and fire rooms of the whole force of mechanicians. It is, therefore, only a tactical element that permits, at a given moment, giving a leap forward when in contact with the enemy.[88]

[88] On war-ships, where the weight and space allotted to the machinery are limited, high speeds have been attained by means of an expedient; thanks to very elastic boilers that can burn up to 200 kilograms of coal per square meter of grate surface, there is obtained by forced draft an overproduction of steam that is used in giving an excessive number of revolutions to the engines. For cruising speed it is necessary to reduce the power of the engines to the normal. When this result is attained, the weight per horse-power is almost as great as on merchant steamers.

Radius of action, together with speed, gives the ship *mobility*. But the relative importance of these two factors is not the same. Speed is a prodigal that spends without counting and quickly uses up its resources. Radius of action is distinguished by perseverance and tenacity. One is a brilliant quality; the other a solid quality.

However weak a naval force may be, there will never be any difficulty about utilizing it, if it has mobility; it will always be possible to find for it a field of action where it will not be confronted with the cruel necessity of yielding with honor.

VIII.

Homogeneity.

The object of homogeneity is to secure the maximum return from speed and radius of action.[56] It is the factor that above all others gives economy of forces. Lack of homogeneousness in a fleet constitutes a useless squandering of force and money. It is evident, in fact, that the speed of a squadron is regulated by that of the slowest ship and that the extent of operations is limited by the resources of the ship which has the least of them.[57] It may be necessary, therefore, on account of a single ship, not to utilize the qualities of a whole body of ships.

Since heterogeneousness is a source of weakness, the weakest navy ought logically to strive with the most tenacity for similarity of types.

Unhappily, France has never done so. Never has she taken pains to give her squadrons a reasonable composition. Matters have even gone so far that it seems as if there had sometimes been an endeavor to compose a mixture of unlike ships so that there might be some for every taste. It was doubtless thought that the superior qualities of some would compensate the deficiencies of others, and that all lumped together would have an average value.

Some attempts have been made to follow a more reasonable course; they were partly abandoned and moreover were but im-

[56] We are here speaking only of strategical homegeneity; further on we shall consider the character of tactical homogeneity.

[57] Extract from one of d'Estaing's cruising reports: "The *Languedoc* and the *César* are the fastest. The *Tonnant* is the third sailer of the squadron; after that vessel come the *Hector* and the *Zélé*. The *Protecteur*, *Fantasque* and *Sagittaire* are what is called three companion ships. The *Marseillais* and the *Provençe* sail fairly; as for the *Guerrier* and the *Vaillant*, they are the two worst sailers of the squadron. . . . . You may get an idea of the slowness to which we are condemned by the *Guerrier* and the *Vaillant* from the fact that of all the merchant ships that have joined us none have separated from the squadron except when they wished. These two ships labor and risk theirs spars, keeping always under full sail, while we roll and the sea devours us, because it is constantly necessary to shorten sail to wait for them."

perfectly carried out. How reach a logical solution when, in our navy, each unit has its special character? It is enough to cite the *Redoutable, Dévastation* and *Courbet* to show that ships can have very different capabilities in spite of a certain similarity of lines. Our latest squadron itself is not homogeneous as regards armaments.

One would like to know the rôle intended to be assigned to a division such as our Far-Eastern squadron was quite recently (*Bayard, Vauban, Isly, Pascal, Éclaireur*). These ships embarrassed each other, without being able to mutually support one another. It would have been at least logical to give to the less armed ships the greatest speed; yet the *Kersaint,* which replaced the *Éclaireur,* was built for 16 knots, while the *Pascal* steams 19.

At all periods the English have cared more than we for homogeneity. It is known with what care the squadrons that had the mission, always delicate, of revictualing Gibraltar in the presence of the enemy were composed. The cohesion that was the advantage of homogeneity was not unconnected with the success of this operation. In our times, the English fleet has this same characteristic that is so wholly wanting to ours, because in England ships are built in groups and improvements are introduced in a whole group.

It would be vain to seek in the past for instances of lack of homogeneousness procuring advantage, while its disadvantages are revealed to us on every page of history. What fatality then weighs upon the French Navy that it persists in not seeing this?

Beyond doubt, a great effort was made to try—without, however, succeeding—to have at least one homogeneous squadron of battle-ships; but this laudable intention did not extend to armored cruisers, which continue to be samples. The *Léon-Gambetta, Ernest-Renan* and *Waldeck-Rousseau* have different batteries.

There is no situation, in naval warfare, where lack of homogeneity is a greater handicap than in the case of a naval force obliged to take to flight. At the end of a short time the ships are trailed out in the order of their speed and fall successively into the enemy's ranks.[a] A uniform speed, however small, would compel making a stand and the battle would have a less unfavorable aspect.

[a] This was the cause of the Quiberon disaster and the origin of the loss of de la Clue's ships.

Homogeneousness of squadrons has not the same value as that of the ships of each squadron by itself.

There is no advantage in having several squadrons of the same characteristics. Naval material is always being improved upon, and, if it were wished to have all our squadrons similar, we would be distanced by rival navies, or would be deprived of the assistance of ships already old, but not destitute of military value. The different fractions of our forces will have to fulfil different duties that do not require them all to have the same qualities to the same degree; if they have to unite, they will not all have the same road to follow. It will be sufficient, therefore, to give the hardest task to the squadron that has the most means.

In any one squadron, it is the homogeneity of the fighting line alone that is important. The light vessels that spread in all directions will frequently be employed singly. On the different services that are given them, they will have to display all their qualities, and the more these qualities are developed the better; but the older vessels, and consequently less well equipped, will not be the less useful in default of others; they will render services of less value, but still valuable. Moreover, the employment of light vessels is of so various a nature that it even requires sometimes different types.[89] The relative homogeneity given them will, therefore, result from considerations of economy rather than of strategy, because variety is a source of expense.

[89] Scouts of small draft may be needed, and others of great radius of action.

THIRD PART.

OPERATIONS.

I.

The Attack and Defense of Coasts.

In our time coast defense has assumed such a preponderance in the thoughts of the naval world that it seems, by itself alone, to embody naval war. According to some, we have built a navy at great expense only to secure "the inviolability of our shores"—such is the consecrated expression. Others, seeking to discover the unknown of future struggles in the naval operations of the last century, have observed that they almost all took place along the coast and were summed up in attacks upon fortified works, combined with landings; thence they have concluded that naval warfare in the course of its evolution has taken a new form, of which the type is furnished by the American Civil War, and the Crimean expedition.

Before imposing this system of warfare upon France, with all the consequences that it entails in respect to material, the causes which gave birth to it should first have been determined; it would then have been found that, during the American Civil War, the Confederates had an improvised navy, absolutely unfit for carrying on a war, and that, during the Crimean expedition, the Russians sunk their ships. In both cases, therefore, the aggressor found himself, at the very outset, in a position as advantageous as if he had previously destroyed the offensive forces of the adversary, and these examples do not furnish us with any indication as to the influence that naval forces will exercise upon the protection of the coast.

The public always looks with favor upon coast defense; without responsibility for the conduct of war, it sees above all the evils that war engenders, and is frightened at the idea of suffering its consequences. The ready-made opinions of those facile writers who flatter the instinct of self-preservation innate in man are, therefore, freely accepted. Under this influence, each village, each city, each region craves its share of protection; the spectre of the *Augusta* ravaging our shores in 1870 is evoked, and batteries, torpedo-boats, coast-defense ships and even squadrons are demanded.

Whither do such exaggerations lead? For, after all, the always-cited *Augusta* captured but two steamers and a navy-yard auxiliary; and we have not built two hundred torpedo-boats and spent hundreds of millions on battleships in order to arm ourselves against such a danger as that. It will be impossible to carry on war if all our resources are devoted to repelling imaginary dangers.

War, we cannot too often repeat, can have no other object than imposing upon the enemy the law of the stronger. We have no right, therefore, to regard the defense of the coast as an independent question, which leads to becoming absorbed in the accessory to the detriment of the principal. It can only be taken into account, in the employment of our resources, from the point of view of its relations with the public wealth that nourishes the war. The share that goes to it ought to represent only an insurance premium proportional to the capital guaranteed. If the premium is greater than the insured capital, it is an absurdity.

The first thing to do, therefore, is to take account of the danger incurred from expeditions against the coast and the chances of their taking place. We shall then try to determine if it be not possible to secure an efficient protection of the coast without impeding the offensive action that alone can bring the enemy to terms.

It is curious that those who profess to see in attack upon our shores the supreme calamity have confined themselves to recording facts without weighing their import. Yet the study of causes and effects is the best basis of estimation that we have: we will begin with it.

ATTACKS AGAINST THE COAST IN THE REIGN OF LOUIS XIII.*

In 1627, France has no navy. The enemy can insult our shores without fear of being taken in the rear; if he attempts a landing, the sea gives him a line of retreat and secure communications.

England takes advantage of this to endeavor to get a foothold

* For the attacks that took place upon the Atlantic coast during the period comprising the reigns of Louis XIII and Louis XIV, we have followed the account of Mr. Georges Toudouze, who has published an excellent work, with full references, upon the organization of the defense of the coasts in the seventeenth century. We quote verbatim such passages as are of special interest.

in the midst of the rebellious Protestant communities, and to acquire a base of operations with a view to reconquering the ancient kingdom of Aquitaine.

On July 20, Buckingham appears before the island of Ré with 120 ships carrying 8000 soldiers.

On the 26th, the landing is completed; the 27th, the little French garrison, forced to retreat, shuts itself up in the citadel of Saint Martin, where it is immediately besieged. The siege lasted five months.

In spite of a reinforcement of 4000 men, Buckingham could not overcome the heroic resistance of Toiras; and, on November 27, he re-embarked, taking back to England only 2000 men.

The failure was complete.

ATTACKS AGAINST THE COAST IN THE REIGN OF LOUIS XIV.

War breaks out, in 1672, between Holland on one side and France and England on the other.

The first two years pass in conflicts of squadrons against squadrons; they are signalized by the battles of Southwood, Walcheren and the Texel; but in 1674, Holland, having made peace with England, takes advantage of the transfer of all our forces from the Atlantic to the Mediterranean to attempt systematically to ravage our sea coast.

Tromp, with a fleet of 36 ships and 34 transports, carrying 8000 men, first cruises off the Normandy coast, seeking a landing place; but he found the shore so well guarded everywhere that he dared not risk his troops.

At the end of June, the Dutch fleet appears at the entrance of the Iroise; a storm drives it out to sea. It then proceeded to Belle-Isle where it anchored on June 27.

Count Horn, who commanded the troops, summoned the place to surrender. The governor of the island having refused to yield, the Dutch general did not dare to force a landing and employed a classic method.

During the night fifty men were put on shore at the little village of Locmaria, and set fire to the houses. Thanks to this diversion, which attracted the defenders of the island, the troops were able to land in the harbor of Grand-Sable without opposition.

The garrison of the island took refuge in the citadel, expecting

to support a siege; after a fruitless assault, the Dutch were content to ravage the island, and on July 4 they got under way and steered for Noirmoutiers.

The hostile fleet remained off this island three weeks, while the disembarked forces levied contributions upon the inhabitants, destroyed the fortifications and laid hands on private properties. After having loaded his ships with the spoils, Tromp got under way and proceeded to make a peaceful demonstration in the Straits of Oléron; then he finally left the Atlantic and went to join the Spaniards in the Mediterranean.

"Nobody in France at all understood this strange expedition which journeyed along the coast and whose greatest exploit was the pillage of Noirmoutiers."[61]

Our shores were troubled no further until the Peace of Nimeguen: the fleets of both sides operate in the Mediterranean, where they have neither the time nor the means of doing harm of a purely material nature.

We come now to the war of the League of Augsburg.

The first four years pass without attacks upon the coast: it is the period when our naval power is at its apogee and enables us to hold in check the united forces of England and Holland. Three years in succession, Tourville paralyzes the efforts of the allied fleets, and even inflicts defeat upon them at Beachy Head. But, in 1692, he is beaten at La Hogue, and with the following year the enemy reappears off our coasts.[62]

Louis XIV, in fact, yielding to Pontchartrain's solicitations, renounces the struggle of fleets in the Atlantic and sends Tourville into the Mediterranean.[63] The following year this admiral goes again to the Levant, where his squadron remains until the

[61] Georges Toudouze, *La Défence des côtes de Dunkerque à Bayonne au dix-septième siècle.*

[62] The battle of La Hogue was fought at the end of May. The allies, therefore, had time to profit by their victory, campaigns not ending until the autumn; in fact they had planned a combined attack upon Saint Malo, but the season slipped away before the naval and military authorities were able to agree upon the plan of operations (see Colomb, *Naval Warfare*).

[63] He set sail from Brest, on May 26, with seventy-one ships, almost the entire naval force of France. It was during this voyage that he met, off Lagos, a convoy of four hundred sail escorted by twenty-six ships, part of which he captured.

end of the war very nearly without occupation."[a] The Atlantic, therefore, remains undefended.

It was Saint Malo that sustained the first onset.

On November 27, a fleet composed of "twelve ships, twelve bomb-ketches, twelve brigantines and several gunboats," under the orders of Captain Benbow, arrayed itself in the roadstead.

For five days the town was bombarded. Although the defenses were far from complete, the inhabitants, seconded by the troops, put a good face on the matter and replied energetically.

It was on this occasion that the English made trial of those infernal machines * that they were to make frequent use of in this war and that never yielded anything but disappointments. The *Vésuve* was blown up, but destroyed only her own crew.

The enemy reckoned upon destroying a nest of privateers when he appeared off Saint Malo; he only succeeded in breaking windows and slates. "It is no joke, says a contemporary account, to say that with the exception of a soldier who disappeared from the Bidouane tower where he was on sentry duty, and of the poor devil of a gunner before mentioned, our only loss was an unfortunate cat killed in a gutter."[b]

After this exploit, the fleet went to its home ports to winter.

In order to restore their prestige, the allies prepared, for the next campaign, an attack upon Brest. The plan consisted of landing a small army on the peninsulas of Kelern in order to destroy all the defenses on the south side of the narrow entrance and so to permit the ships to go through the passes and reach the arsenal.

On June 17, 1694, the Dutch-English fleet, commanded by Lord Berkeley, entered the Iroise and moored at the entrance of the passage, between Bertheaume and Camaret. It was composed of 22 English ships, 19 Dutch, 12 bomb-ketches and a great number of transports.[c] General Tollemache was in command of the landing force of troops, 6000 in number.

[a] He left Brest on April 24.

* "Machines" or "infernals" were fire ships arranged to explode.—P. R. A.

[b] Quoted by Georges Toudouze.

[c] Colomb, *Naval Warfare*. We have given preference to the figures of English historians as regards the composition of squadrons and the number of troops; on the contrary, we have adopted the French version of the

That very evening a frigate went to reconnoiter the beach at Trez-Rouz, on the Camaret side, where the landing was to take place; but scarcely had she approached the shore when the fire of the batteries forced her to withdraw. It was a disappointment: Lord Berkeley was not expecting any resistance and, since the French were on their guard, the situation took on quite another aspect.

In a council of war, the admiral was in favor of giving up the expedition; but General Tollemache's opinion prevailed, and the landing was agreed upon for the following day.

In the night, Vauban, who commanded the defense, sent reinforcements onto the peninsulas of Kelern; everyone got ready to receive the enemy.

On the 18th, as soon as the fog lifted, seven frigates got under way, with Rear-Admiral Carmarthen in command, to protect the landing.

"Carmarthen made preparations to direct his whole fire against the fort (of Camaret); but scarcely had the seven frigates cleared the reef that terminates Convent Point when the entire circuit of the shore burst into flame, and a terrific fire, from batteries whose existence was unknown to the allies, was poured upon the seven ships. For a moment they were thrown into a disorder and confusion that only the impetuous valor of Carmarthen saved from being fatal to them. While he established order in the action so brusquely begun, and recovered his men from their surprise, Berkeley made a last effort to induce Tollemache to withdraw from his enterprise in view of such a superiority of the defense. But the lieutenant-general would pay no heed and took the leadership of a hundred boats containing the first troops of the landing force.

"Very gallantly, meanwhile, three frigates brought their broadsides to bear at half-range from the batteries of Convent Point; three others attacked the little fort of Camaret, and the seventh stood for the beach of Trez-Rouz to be ready for the arrival of the boats. The latter, in their turn, entered the circle of fire formed by the French batteries, which sunk a number of them; the rest, nevertheless, put ashore under the most frightful fire

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results of each operation, because the enemy never made an exact return of the damages he did.

from artillery and small arms that can be imagined, and the troops, already harassed, began to land among the breakers. But, taken from one side by a battery, shot at from the front by marines and coast-defense militia sheltered behind breastworks overlooking the beach, the Dutch-English deployed in a disorderly manner on the wet sands and their decimated lines wavered. Too numerous to be all sheltered behind an enormous rock that occupies the center of the beach, they were not sufficiently numerous to attempt to assault intrenchments; the murderous fire that they endured delayed the arrival of other boats, already hindered by the ebb tide, while the supporting frigates with great difficulty made head against the French batteries

"In this critical situation, a very visible hesitation showed itself in the ranks of the disembarked soldiers: seizing with the greatest good fortune upon this instant of indecision, MM. de Benoise and de la Cousse rushed sword in hand onto the beach and, at the head of a hundred men from the volunteer companies, ran straight at the 1200 or 1300 Dutch-English drawn up along the sands. Following at once this bold example, 1600 to 1800 coast-defense militia, who were occupying the ridges bordering the beach and many of whom were armed only with sticks and scythes with handles reversed, rushed in a body upon the enemy with savage cries. A furious but brief hand-to-hand conflict ensued. At the very beginning Tollemache fell, mortally wounded; he was immediately borne to his boat, which escaped under oars and sail, as did also all the boats that had not yet been beached. It was the beginning of a complete rout; the disembarked troops wished to flee, but the falling tide had left their boats aground and the overloaded craft remained stranded. The supporting frigate gave way in her turn and stood off, three-quarters dismantled and powerless to help. On the beach, in spite of a very fine resistance, 800 soldiers lay dead, and the 400 to 500 survivors laid down their arms to a squadron of Du Plessis-Praslin's regiment, arrived post-haste to save these unfortunates to whom the coast-guards, drunk with fury, refused any quarter.

"In a few moments all was over and shouts of victory rang about the circuit of the bay, while the batteries. still keeping up a rapid fire, hailed projectiles upon the retreating boats and the frigates already so harassed. The *Monck*, Carmarthen's ship, after having in vain sought to force the Camaret entrance, her

yards carried away, her sails in tatters, her hull pierced with shot holes, had to call for a tow. The two frigates that had attacked the little fort of Camaret retreated in their turn, after having knocked down the bell of the chapel of Notre Dame of Roc-Amadour, situated on the jetty, beside the fort, and on the walls of which the marks of their shot are still to be seen. But of the three ships that struggled painfully with the batteries of Convent Point, only two could regain the fleet. The third, a Dutch 34-gun ship named the *Wesep*, was too near the shore; she touched bottom on the shoal known under the name of Coréjou, could not lighten herself and remained stranded with 12 feet of water in her hold, under a terrible fire: she finally surrendered to M. de La Gondinière, whose musketeers were shooting the crew from the top of the neighboring cliff; forty dead were found on her and 60 prisoners. Just prior to this, a boat loaded with infantry had been sunk outright in the middle of the bay by a shell from the battery of two mortars established on Convent Point.

"Little by little, the remnants of the expedition rejoined the main body of the squadron, over which reigned profound discouragement; the losses, in fact, were out of all proportion with the duration of the fight. On the beach of Trez-Rouz, 800 men had perished; 500 were prisoners; 400 to 500 soldiers and sailors had been killed on the ships and in the boats; 2 vessels and 48 boats were lost. It was a veritable disaster, and English historians have vainly sought to conceal its full extent. Tollemache, enraged at having been beaten by peasants, wished to attempt savage reprisals; he demanded that Berkeley force the entrance of the harbor at any cost and destroy the town of Camaret with hot shot from the entire squadron, to avenge upon the inhabitants his bloody repulse. This proposal on the part of the lieutenant-general was rejected by the members of the council of war, who were little anxious to engage in a new action; and Berkeley, whose too well-founded apprehensions had been justified by the event, ordered sail made. The allied squadron, lifting anchor, started back for England, but its misfortunes were not over; in doubling Ouessant, it had to abandon to sink in those waters two ships that had suffered much in the battle of the 18th, and it was then assailed for five days by a violent storm from the southeast. It only reached Portsmouth at the end of the month, much crippled."[97]

[97] Georges Toudouze.

Made ridiculous at Saint Malo, beaten at Camaret, the allies sought a revenge that could repay them without making them run any risk.

They fixed their choice upon Dieppe, a town almost without defense.

In the middle of July, the town was bombarded. The houses, built of wood, were soon set on fire by the action of shells; two-thirds of the town was consumed by the flames. The inhabitants, moreover, did nothing to arrest the conflagration.

After this easy success, the Dutch-English went to Havre to recommence the same operation. But there arrangements had been made to combat the fire, which was the only serious danger from such bombardments. The damage done was unimportant; moreover, the place made a good defense: twice the batteries forced the hostile fleet to change its anchorage and blew up a bomb-ketch.

After having remained five days before Havre, the allies proceeded to Dunkirk: "but there they had to deal with a veritable stronghold and they were awaited resolutely; the forts were well armed and supplied, and Jean Bart in person had accepted the command of six long-boats and eleven chaloupes intended to give a warm reception to bomb-ketches that came near the harbor.

"The enemy appeared on September 20, and the advance guard of frigates that came to sound the roadstead gave way under the fire from the Risban and the citadel. The 22d, thirty-six ships, frigates and fire-ships came to attack the forts at the head of the jetties, but the guns of these forts blew up the two infernal machines brought by the fleet, before they were able to secure them to the framework of the jetty; and after this check the enemy withdrew out of range of the artillery.

"They only got up anchor on the 26th, to throw some bombs, without result, into Calais; from Calais they went to cruise off Cherbourg and finally returned to England."[*]

The campaign of 1694 was over. According to custom, the fleets took up their winter quarters and only rearmed in the spring.

In 1695, the objective of the allies has not changed: they wish at any cost to utterly destroy the haunts where our privateers took refuge. The towns of Saint Malo and Dunkirk, therefore, will sustain their principal attack. But, doubtless attributing their

[*] Georges Toudouze.

repulses in the preceding year to the insufficiency of their means, they increase their forces. It is a fleet of seventy ships that comes to anchor off Saint Malo on July 14.

The 15th, the enemy endeavored, without any success, to destroy the Conché fort; they fired 1500 to 1600 shells, only 900 of which fell in the town, and the appraisement that was made on the following 30th of July gives as the sum total of damages 103,532 francs, and as the number of victims 20 to 25 persons, besides four soldiers of the Oléron regiment. As for the allies, their losses, which can scarcely be estimated accurately, must have been great, for the English historian Smollet says that the English bomb vessels suffered more harm than they caused. What is certain is that one of them ran aground at Césambre and another was burned and then abandoned by her crew; besides which three double chaloupes were sunk."[69]

The enemy perceived that they were uselessly expending their time and money, and on the 17th they withdrew. But while the main body of the fleet proceeded to England, a newly arrived detachment delayed to throw 500 shells into Granville, "without doing much damage, although the English boasted of having left that town in flames."[70]

After having revictualed, the allies appear before Dunkirk in August.

It is probable that the commanders of the fleet understood very well that they would be no more successful than at Saint Malo, but their governments still had a right to preserve their illusions; since, judging by the English accounts, the admirals, not daring to avow their repulses themselves, aided to deceive them by exaggerating the results. If what they said had been true, it would not have been necessary to attack the same places after such short intervals.

This time, the number of bomb-ketches had been increased to twenty.[71] It was all to no effect, or rather it had this effect—never again did the English attack Dunkirk.

[69] Georges Toudouze. [70] Georges Toudouze.

[71] At this epoch, bomb-ketches, invented by the French engineer Petit-Renau, played the principal part in bombardments. The movable sight not existing (it did not appear till the middle of the 19th century), gun fire was very uncertain, and the ketches, owing to their small size, offered a target very difficult to hit. Advantage was taken of this to bring them as near

"Finding themselves in this sorry plight, being obliged either to endure the fire of the batteries or to risk being lost on the Brack shoal, the enemy preferred, according to Clément's phrase, 'to wipe away their grief upon Calais,' which they did, however, to a very moderate degree, since, although they did some damage, they could not, in spite of all their efforts, burn or destroy the wooden pier that sheltered Calais on the side of the sea." [73]

In 1696 the allies become more cautious; in May they bombard Calais in a spiritless way, make a demonstration before Brest, and come to anchor in Quiberon bay.

Landings were made on the two small islands of Houat and Hoëdic, as well as at Groix; these islands, in view of their unimportance, were absolutely without defenses.

"The English historians have represented these islands as of great extent, populous, with large towns and innumerable villages; they say that twenty villages were burned on Hoëdic, where there were scarcely that many cottages, and declare that six hundred cattle were taken away or killed on that island, which could not have fed half as many; as for the town of Houat, it has never existed except in the imagination of historians eager to conceal the insignificance of these expeditions: thus Father François-Marie Galen, who was an eye-witness, continually heaps sarcasms upon them in this connection." [74]

After these exploits, Admiral Rooke, who commanded the allied fleet, attempted a landing at Belle-Isle with 8000 men.

But there there was an energetic governor and a garrison, small it is true, but which sufficed for the population to gather around; in a word there was an organized defense. Thus, when the troops wished to land, they were so badly received that they did not insist. The memory of Camaret seems to be still present in the minds of the allies, for the fleet remains eleven days before Belle-Isle without daring to do anything. During this time, a detachment goes to throw a few shells at Sables-d'Olonne and into Saint Martin-de-Ré, in order not to return to England without anything to tell of.

Peace was signed in the following year.

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as possible to the shore, whence they launched shells against the town, while the ships kept at the extreme range of the batteries. This explains why the latter suffered so little in this class of operations.

[73] Georges Toudouze.

[74] Georges Toudouze.

Thus for three successive years the English immobilized enormous forces to bombard our whole coast, and all these armaments served only to reduce to ashes one small town. The English historian Burchett recognized that when everything was taken into account the result was disproportionate to the expense.

The enemies recognized the fruitlessness of bombardments, and, during the war of the Spanish Succession, we shall see them give up ploughing our fields with shot and devote themselves exclusively to landings. But they will act with such circumspection that their troops will only once succeed in setting foot upon French soil.

As in the latter years of the preceding war, France abandoned the Atlantic. She made over part of her western forces to privateers to prey upon commerce; the rest were sent to Toulon or employed in protecting convoys.

The English took advantage of this to attempt to surprise Cadiz with 14,000 men, which was unsuccessful, and to destroy at Vigo the Spanish galleons and Château-Renault's ships which were convoying them.

In 1703, the same fleet made a useless cruise along our coasts. Yet it had put to sea with magnificent projects: nothing less was proposed than to destroy all the defenses that protected the straits, then to ruin Rochefort and to end by a landing at Brest.

Admiral Rooke, who commanded the fleet, brought with him a landing force of 7000 men; he had even had the foresight to have vessels laden with stones made ready to obstruct the passes.

But it is far from conception to execution: the start is made with fine resolutions; then, on arriving at the spot, it is perceived —though rather late—that to land a handful of men in a country like France is very dangerous; then prudence is seen to be the better part of valor.

As a matter of fact, Sir George Rooke first steered towards the shores of Saintonge, and then all at once went to the north. It has been said that he received notice of the presence of a French squadron of twenty-six ships, and that he wished first to get rid of them; but this squadron did not exist.[74] At the beginning of June the hostile fleet anchored off Belle-Isle.

[74] It is probable that it was a convoy of merchant ships escorted by a few war vessels.

Had the English admiral come there bacause there was nothing else to do, or did he really intend to make a landing? The fact is that he remained a fortnight off Le Palais without doing anything. On the other hand, the active preparations going on on shore showed clearly that, if the enemy landed, they would find a warm reception. In 1696, Rooke had had a taste of what the governor could do, and perhaps this memory had something to do with the resolution to withdraw that he arrived at.[75]

Dissatisfaction with oneself often leads to the venting of one's rage upon inoffensive people. The English, before returning to England, sought an expiatory victim and fixed upon the island of Groix, which this same Admiral Rooke had twice devastated in 1696.

"This island, which was without troops and without fortifications, would certainly have seen repeated the disaster from which it suffered in 1696 but for the parish priest, who saved it. 'Thanks to a strategem conceived by the priest, the English believed that they were confronted by a considerable number of regular troops, and so did not land. The priest made the women and girls put on red caps and ordered them to stand in line with all the men on the highest part of the island, which slopes down towards the sea. The population, mounted upon horses, asses, cows and oxen, so deluded the English admiral that he did not dare to go any further . . . .' The priest received from minister Pontchartrain some most curious letters, in which the latter presented him with a draft for 500 livres on the bishop of Agen, for the services he had rendered, and named him commandant of the militia and coast-guards, in case of the absence of officers."[76]

After 1704, the English government's attention is drawn towards the south. The same fleet that operated in Spain in 1702, and in France in 1703, escorts as far as Lisbon an army corps intended to support the claims of the Archduke Charles; then it takes Gibraltar by surprise and is kept in the Mediterranean by the squadron of the Count of Toulouse, with which it has an encounter at Malaga. After the disarming of our ships, it takes part in the

[75] "When the hostile fleet appeared before Belle-Isle, the governor, Hervé de la Ferrière (the same as in 1696) was hunting on the mainland. A vessel was sent to look for him and brought him back through the fleet."—Georges Toudouze.

[76] Cabart-Danneville (report to the Senate) and Georges Toudouze.

military operations before Barcelona; then it winters at Lisbon and in English ports.

The following year (1706) the appearance of the Count of Toulouse before Barcelona draws the allies into the Mediterranean; they force our squadron to retire to Toulon.

Thus, for three years, our shores enjoy complete tranquillity. But in 1707 the Duke of Savoy and Prince Eugene besiege Toulon by land, and Shovel, who commanded the hostile naval forces, thinks the moment favorable to disembarrass himself of our ships, which, in spite of their disarmament, are a permanent menace.

It was only an alarm. The hostile army having raised the siege at the end of ten days, the fleet lost all hope of penetrating into the harbor, and it withdrew after having emptied its magazines to no effect.

The following year a hostile fleet reappeared in the north.

Admiral Byng anchors, on August 20, 1708, off Vaast-la-Hougue, with sixty ships.

As soon as the presence of the hostile fleet was signaled, the Marshal of Matignon hastened with three regiments to the assistance of the little garrison of the place.

On the 23d an attempt at landing fails; the boats do not even reach the beach.

The fleet then gets under way and goes to show itself before Cherbourg; then, suddenly, it comes back to its former anchorage. But the defense has not fallen into the snare, and from all directions troops flow in.

On the 28th the boats once more approach the shore, and, as on the first occasion, they have to regain their ships without having been able to disembark the troops.

The enemy doubtless hesitated to go away baffled, since, for a month, they remained on the Cotentin coast, and it was not until the end of September that they definitely withdrew.

This repulse took from the English for the remainder of the war the desire of attacking anew our western shores; they thought they would be more fortunate on our Mediterranean coast, which, not having as yet felt such invasions, might be less prepared to repel them.

Actually, 700 men were easily able to land in the neighborhood

of Cette, on July 19, 1710; the following day they took possession of the town, while the ships exchanged broadsides with the forts.

The object of the English was to offer help to the Protestant peasants of the Cévennes, who were then in full revolt, and to carry aid to them in the shape of men and money by taking the town of Cette as a base of operations; but the English government must have been very ill-informed as to the importance of these risings to expect to maintain itself in French territory with such a ridiculous force.

On the 21st, the town and bridge of Agde were taken; then the enemy stopped, not daring to adventure further. On the 27th, the heads of column of the French troops were signaled at Mèze. Threatened with being cut off, General Seissan requested the English admiral to send armed boats into the lagoon of Thau to prevent the French from fording it;[n] but, at the same time, information was received that considerable forces were marching on Agde. Retreat was necessary. The English withdrew upon Cette; hard-pressed, they could only pass through the town to gain their boats, and they only embarked at the sacrifice of their rear-guard.

This attack was the last of the war, which was ended on April 11, 1713, by the treaty of Utrecht.

Attacks against the coast in the reign of Louis XV.

During the naval wars of the reign of Louis XV, attacks upon the coast continue, but they take on a new character.

Objectives remain the same; methods are different. The English systematically refrain from bombardments; they endeavor to take our maritime towns from the rear by landing bodies of troops numbering as much as 14,000 men; but, taught by experience, they avoid, as far as possible, forcible landings, and, in order to find undefended beaches, they are obliged to disembark far from their objectives; whenever the defense does not lose its head, this separation is fatal to them.

The war of the Austrian Succession was marked by but a single attack upon the coasts. After the battle of Toulon, which deter-

[n] The towns of Cette and Agde are separated by a long dyke which is washed on one side by the sea and on the other by the lagoon of Thau. Mèze is on the edge of the lagoon near its middle.

mined the official declaration of war,[11] France prepared an expedition to attempt once again the restoration of the Stuarts. The active surveillance of the English squadrons ruined these projects, and the French squadron that had been armed was broken up: a part went into the Mediterranean, other ships went to Lorient and Rochefort.

But the English government still had causes for anxiety; Charles-Edward, son of the Pretender, had landed in the north of Scotland and had raised the country. For nearly two years he held in check the troops launched in his pursuit.

So long as this heroic frolic lasted, the enemy's squadrons cruised off our coast, from Dunkirk to Rochefort, to intercept any aid sent to the prince. When Charles-Edward, having no more soldiers, was reduced to wandering as a fugitive in the Scottish mountains, the British government breathed again; and then only did it think of attempting to surprise Lorient in order to ruin the establishments of the East Indian Company.

Admiral Lestock anchored on October 1, 1746, in the bay of Pouldu with 16 ships, 8 frigates and 2 bomb-vessels; he escorted a convoy carrying 5800 troops commanded by General Sinclair.

A landing was effected the same day; on the 2d, the English seized Guidel and Plimur, and established their camp between the two places. Thence General Sinclair sent to summon the town to surrender.

The inhabitants were not high-spirited: although Lorient had walls armed with cannon, it could not be considered a stronghold. The authorities signed a truce and entered upon deliberations as to the course that should be taken.

While the people of Lorient discussed the matter, the English general conferred with his admiral; for, if the French did not think their situation a good one, the English found theirs worse: at any moment they might be cut off from their ships.

At the end of several days the inhabitants, intimidated by a few cannon shot, decided to surrender; a flag of truce left the town to agree upon the terms of capitulation. But precisely at this moment, the English had reached the conclusion to retire; and they had struck their camp so hastily that they left behind four cannon, a mortar and a quantity of stores. Sinclair had received notice of

[11] Hostilities had already begun, according to the English.

the assembling of troops, and, not knowing whether he would have to deal with a company of 100 men or an army of 20,000 soldiers, he had preferred to retreat. Actually, thirteen battalions and fourteen squadrons were advancing under the orders of MM. de Saint-Pern and de Coëtlogon, but they were still several days' march away."

On Oct. 9, the fleet got under way. Lestock, not daring to return immediately to England, cruised for a fortnight off the coast, made a landing at Houat and at Hoëdic, and finally went away on October 23.

Was it the failure of this expedition that kept the English away from our coasts during the rest of the war? It would seem so, for the few ships that we had kept armed could not have interfered with them.

The Seven Years War began with a setback for the enemy: France seized Minorca before the English had had time to send forces into the Mediterranean.

The loss of Minorca was deeply felt in England and public opinion loudly demanded reprisals. The occasion was favorable: after a first effort crowned with success, the French navy seemed for three years to be non-existent; it was then directed by Berryer, who had set his heart on ruining it.

England had a fine chance and took advantage of it.

A fleet composed of seventeen ships of the line, under the orders of Admiral Hawke, set sail from Portsmouth on September 7, 1757; it escorted a convoy carrying 10,000 men. On the 20th it was made out by the lookouts on the island of Ré beating to windward to approach the land; on the 22d it anchored in the Basque Roads. There was no doubt but that it had designs against our Rochefort arsenal.

On the day following, the island of Aix, which was defended by only 16 cannon and had a garrison of only 250 men, fell into the hands of the enemy. The English made as if to land at Châtelaillon, where there were a few hundred coast-guards; they were prevented, it is said, by the state of the sea. They likewise made a demonstration before Fouras, where Lieutenant-General de Langeron had gone; on September 30 they retired, abandoning the island of Aix.

[n] These troops had been detached from the army of Marshal Saxe.

During all this time the most extreme confusion continued to reign at Rochefort, where there was much more thought of seeking safety than of putting up a defense. Here again there was as much fear on one side as on the other; M. de Langeron, with a few companies of regulars and coast-guards, saved the situation by his energetic attitude.

The following year Admiral Hawke reappeared off the island of Aix; but this time the land was not his objective. He brought with him only seven ships and three frigates, and had in view only the destruction of an important convoy bound for the colonies. We shall, therefore, merely mention this operation, which does not belong to the class of attacks on the coast;[86] but, some time after, the invasions recommence, and it is again Saint Malo that attracts the English.

An immense effort was made: a hundred transports carried 16,000 men under the orders of the Duke of Marlborough.

On June 5, 1758, the fleet, commanded by Lord Howe, anchored in Cancale bay. A landing was effected without difficulty, and Marlborough, after establishing an intrenched camp to protect his embarkation in case of a reverse, began to march towards Saint Malo. On the way he delayed to ravage the country, and when he arrived under the walls of the place the Marquis de la Châtre had had time to shut himself up in it with 2000 men and to put it in a state of defense.

Unable to penetrate into the town, and not anxious to make an assault, the English burned all the vessels that were in the harbor of Saint-Servan. Meanwhile the Duke d'Aiguillon, governor of the province, directed a movement of all the troops of Brittany towards the coast, and he had already collected several thousand men at Dinan, where he had gone in person.

Fearing to be cut off from his line of retreat, Marlborough decided to raise the siege; the forces at the disposition of the Duke d'Aiguillon were not yet sufficient to disturb him, and he was able to re-embark without loss on June 11. The fleet got under way on the 17th and returned to England.

[86] The enterprise did not fail completely: the vessels, which had been obliged to lighten themselves in order to ascend the river, lost a great part of their stores, and the departure of the convoy was delayed. It consisted of five ships, some frigates and forty transports.

What was the purpose of the English in going to Saint Malo? A thousand horses and twenty-five pieces of artillery were not joined with the infantry in order to burn eight vessels, most of which were only boats.

A week's expedition does not require the mobilizing of 16,000 men and the chartering of a hundred merchant ships.

They intended, therefore, to take the place, and it is not easy to see why they neither tried to open a breach nor to make an assault; or rather it must be supposed that they perceived then that they had put themselves in a false position.

Marlborough's conduct was no doubt severely judged in England, for he was replaced by General Bligh; and, at the end of July, the fleet proceeded to Cherbourg, carrying with it only 6000 men for landing.

In this sad affair of Cherbourg, there are occurrences so extraordinary that it is interesting to give a detailed account of it.

"At the end of July, 1758, it is learned that several divisions of the English fleet are 18 leagues off and that there are some ships beating to windward along the coast off Cherbourg.

"On August 5, the English fleet makes all sail to double Cape la Hague. The commandant of Cherbourg, Baron de Coppley, is informed of this at 9 o'clock in the evening of the same day.

"On August 6, the English fleet directs its course for the roadstead. M. de Coppley informs Count Raymond, major-general, commanding the troops of Cotintin under the orders of Lieutenant-General d'Harcourt, who is living at Caen.

"The same day there are assembled at Caen, the Orion regiment, the Clark regiment, 1200 armed citizens, 20 bombardiers, 72 citizen cannoniers, 6 battalions of coast-guards and the Languedoc regiment of dragoons.

"This made up an effective force of more than 6500 men. And, let us add, the Guyenne regiment and two battalions of militia who are at La Hogue receive orders to remain there, for some unknown reason.

"On August 7, the English fire some shell which, however, do no harm.

"Some of the coast batteries begin to fire: the Tourlaville battery shatters the quarter of a frigate and kills or wounds forty-five men, among others almost all the officers of the ship.

"Ten shots were all that were fired.

"The commandant of Cherbourg orders the firing to cease. It is impossible to find a plausible explanation of this strange fact; moreover, this is only the first of many errors committed by the commandant. General Baron Raymond perhaps wished to await the English in Sainte Anne's Bay, where formidable preparations had been made to drive them back into the sea. There happened what always will happen, namely that the English carefully refrained from landing where their reception had been so well prepared for, and went to Urville Bay, which had been judged impracticable. The landing was effected with much good fortune and skill under the eyes of our troops, who, restrained by the ships' artillery, offered no resistance. The landing force had a strength of about 5000 men. General Raymond then gives orders to retreat; the English form and occupy the dominant positions.

"'Thus,' says the eye-witness from whom we take this account, 'thus astonishingly was carried out an invasion for which we had been preparing two months with all sorts of fortifications in the places most susceptible of attack.'

"It certainly is not the first time (nor will it be the last) that fortifications have caused the loss of wits of a leader ill prepared to make use of them.

"And it must not be supposed that the available troops were not well-disposed to fight.

"'The troops, the citizens, even the residents of the country,' says our author, 'had no fear of an attack on the part of the English. On the contrary, they wished that there might be some attempts against our coast, satisfied that they would be repented of.'

"Not till half an hour after noon on August 8 does General Raymond leave Cherbourg and go on horseback to reconnoiter the enemy; but he does not go even as far as the advance guards of the French troops, and he re-enters the city, leaving for all the troops the strange order to go to rejoin him at Mount Épinguet, 10 kilometers from Cherbourg. In the evening the English entered the city, which no longer had any soldiers. August 9, the fleet lands 1800 more men, and the English occupy Mount Roule, which we have abandoned. August 10, they send a patrol of cavalry to reconnoiter upon the road to Valognes. It gets a hot reception from a small French troop and beats a retreat.

"That day there arrive in the French camp Lieutenant-Generals

Harcourt, Count Coëtlogon and Roth, as well as a battalion from Avranches. August 12, there come likewise to the French camp the Escav cavalry regiment, two battalions from Poitou and four battalions of coast-guards from Caen. August 13, come two battalions of the Saint-Kamans regiment and the Bourbon-Prince cavalry regiment. August 14, the Marshal of Luxemburg arrives.

"The English occupy their time in pillaging the inhabitants, ransoming the city, destroying the jetties, smashing or carrying off the abandoned cannon, sinking or burning the vessels in the harbor, etc. They are not disturbed by any incident during the whole time that they are carrying on the execution of the country. On August 16 they re-embark. On the 17th, at 3 in the afternoon, the generals and French troops re-enter Cherbourg." [11]

Emboldened by this success, the causes of which they do not seem to have discerned, the English wish to redeem their failure before Saint Malo in June; but this time they are to learn that nothing but lack of energy on the part of the defenders can permit such incursions.

Their fleet appeared abreast Cape Fréhel on September 3; on the 4th it anchored off the island of Agot; the 5th the troops disembark in the harbor of Saint-Briac, without meeting any resistance.

If General Bligh's choice of a landing place on the side of the left bank of the Rance was to enable him to disembark unhindered, his calculation was correct; but this advantage was largely balanced by the difficulty of having to cross the Rance to reach Saint Malo. Moreover, the entrance to the river was defended by a line of frigates and privateers; it would have been necessary to penetrate into the interior of the country to turn it. Bligh did not dare to venture so far, and to justify his enterprise he began to ravage the country.

As soon as he had learned of the presence of the English, the Duke d'Aiguillon had gone to establish himself at Lamballe, directing the convergence of all the troops of the region on that point.

Bligh then decided to beat a retreat, and proceeded towards Saint-Cast, where his ships had gone to await him; but he was

[11] *Des Opérations maritimes contre les côtes et des débarquements*, by M. D. B. G.

still far off and he had to traverse Arguenon. For two days the English were harried by our troops; finally they stopped on the plateau of Matignon to concentrate.

"In this position, they were impregnable; but they would have to descend from it, whether to procure food or to re-embark. It was this moment that the Duke d'Aiguillon waited for. He had divided his little army into three bodies; himself, with the central one, was to follow the English step by step, and the two others were to skirt the edge of the sea and attack them in flank whenever they should re-embark. A re-embarkation is always a difficult operation, because there is a moment when one-half the troops is aboard and the other on shore, and the latter need a great deal of coolness and courage to stand their ground. On this occasion there was still another difficulty: the road descending from Matignon to the sea was a steep and sandy slope; it had to be traversed under pressure from all the French forces. On the morning of the 10th, General Bligh began his movement; Admiral Howe's boats were on the shore and the frigates with broadsides bearing. When nearly half the English troops had embarked, the French attacked as arranged, on three sides at once. At first the English stood firm; but quite a large number of them, frightened, having thrown themselves into the water to reach the boats, two of the latter overloaded, went to the bottom; those in others, to avoid a similar mishap, then slashed with their sabers the hands of the unfortunates who were clinging to the sides. At this spectacle, the troops still on the shore, thinking themselves deserted, uttered cries of distress and broke ranks. The disorder was at its height. The frigates, which had not yet opened for fear of hitting their own army corps, began to fire wildly into the confused mêlée of friends and enemies. The Duke d'Aiguillon then had the presence of mind to withdraw his soldiers and force the English alone, in a mass, onto the beach. The frigates perceived this and ceased firing, and the unhappy English soldiers, victims of their grape and cannister, had no other recourse than to surrender, to the number of 3500.[83] The same evening the fleet got under way."[84]

[83] This number is exaggerated. The Chevalier de Mirabeau, who was on the spot, wrote to his brother: "A thousand to twelve hundred killed, seven to eight hundred prisoners." See Lacour-Gayet, *La Marine militaire de la France sous le règne de Louis XV.*

[84] Henri Rivière. *La Marine française sous le règne de Louis XV.*

Meanwhile the Duke de Choiseul had come into power. An ardent patriot, he asked himself if the policy of abstention was suitable for France and if the navy ought to attend impotently upon the ruin of our colonies and the outrage of our shores. Then it was that he conceived the project of an invasion of England which, striking to the enemy's heart, should lay him low with a single blow. Unfortunately the navy no longer had enough ships to successfully conduct such an enterprise, and this attempt led to the loss of our squadrons at Lagos and Quiberon. But the threat of an invasion has always had the quality of disquieting England; and ,this time, as in 1745, she suspended her operations in order to watch over the preparation that were being made in France.

When all danger was averted, she thought once more of appearing off our shores. But experience had shown her the danger of invasions of the mainland, and she turns her attention to Belle-Isle, which for the fourth time in less than a century saw the enemy.

On April 7, 1761, the fleet of Admiral Keppel, of twenty-five ships, appeared; it escorted a convoy of 100 transports carrying 10,000 men.

We have seen that Tromp succeeded in landing at Belle-Isle by means of a diversion; Rooke failed to make a landing by force in 1696, and in 1703 did not dare even to attempt it. So Keppel will first be repulsed in a direct attack, and then by using the scheme of a false attack will succeed thus in getting a foothold on the island.

On the 8th the boats of the squadron disembark troops at Point Andro. The governor, M. de Sainte-Croix, receives them in such fashion that they hastily regain their ships, leaving 400 men behind.

This repulse seems to discourage Keppel; for a fortnight he does nothing. Perhaps he was waiting for the six ships that brought him a reinforcement of 2400 men. As soon as he had received them, the 22d, he bombards Le Palais with his ships, while the boats go to land 4000 men in the harbor of Locmaria.[84] M. de Sainte-Croix arrived too late to oppose the landing; he had

[84] Probably at daylight.

to shut himself up in the town. After an energetic resistance, he capitulated on June 7.[81]

Soon after the preliminaries of peace were opened, and Mahon was exchanged for Belle-Isle. It even seems that the taking of this island was for no other object than to use it as an exchange; for the English could only keep it by immobilizing a squadron to guard the channel that separates it from the mainland, and if hostilities had continued, it would have been a burden upon them.

ATTACKS UPON THE COAST IN THE REIGN OF LOUIS XVI.

During the five years that the war of American Independence lasted, our shores were absolutely unmolested. That is because we had a navy that kept the sea and did not allow the English to devote themselves to games whose fruits were often bitter.

It is fair to say that operations in America did not leave England sufficient resources to undertake expeditions that sometimes required 16,000 men; but she could have recommenced, if she had thought it profitable, such a series of bombardments as distinguished the war of the League of Augsburg. For it is worthy of note that our squadrons never, from 1778 to 1783, sought to protect directly our coasts; they passed, on several occasions, whole months on the coasts of Spain and in the Mediterranean, abandoning thus the entire Atlantic coast and Channel to the enemy's enterprises; but the mere existence of these fleets was a sufficient menace to England to make her more anxious to watch them than to attack the coast.

ATTACKS UPON THE COAST DURING THE REVOLUTION AND EMPIRE.

With the wars of the Revolution and Empire we enter upon the darkest period of our naval history. The bad state of material, the incapacity of commanders and the lack of discipline of crews made our forces so distinctly inferior that we seem to have sent our squadrons out only to deliver them over to the enemy. Yet during twenty years of war we count only five expeditions against our coasts.[82] First comes the capture of Toulon; but an affair of this sort should not be counted, since the city was handed

[81] For the capture of Belle-Isle see: Lacour-Gayet, *La Marine militaire de la France sous le règne de Louis XV.*

[82] We do not refer to unimportant surprises.

over by its own inhabitants, whose treason is a unique occurrence in history. The place, moreover, was soon retaken; though the English occupation had a direct influence on naval operations by causing us to lose an entire squadron.

In 1794 Corsica was occupied by the English, thanks to Paoli's assistance, and evacuated in 1796.

In 1795 and 1800 two fruitless landings took place in Quiberon Bay.

The first has an aspect peculiar to itself: its object was to establish a body of emigrants on the shores of Brittany, and it is doubtful if England would have attempted this venture with her own troops, since the only justification for it was the hope of raising the whole of Brittany.

A French squadron of twelve ships, commanded by Villaret-Joyeuse, was then in the neighborhood of Belle-Isle.

The English squadron under Lord Bridport met it on June 22 off Groix and forced it to take refuge in Lorient, after having taken from it three ships. The convoy, composed of fifty transports and escorted by three ships under Commodore Warren, then proceeded to anchor in the bay of Quiberon, and the landing was effected without difficulty on the beach of Carnac on June 25.

The land defense was in the hands of an energetic leader; so events follow their natural course.

The emigrants, reinforced by several thousand Chouans, advance a few leagues into the interior; Hoche assembles his troops.

On July 16 there is a battle: the emigrants, beaten, take refuge on the peninsula of Quiberon.

On July 21 Hoche takes possession of Fort Penthièvre and penetrates into the peninsula; the emigrants flee towards the beach and are obliged to yield. Bad weather then comes on to further complicate the situation: the boats cannot come close in and so pick up very few people.

On September 11 a convoy of eighty sail entered Quiberon Bay and anchored between Houat and Hoëdic: it brought the Count d'Artois.

The situation in Brittany appearing desperate, the Prince is conducted to the island of Yeu, where he remains till November 7, without daring to set foot in France; on this date the English fleet departs and returns to its own ports.

The attempt of 1800 scarcely took definite shape.

Sir Edward Pellew anchors on June 2 in Quiberon Bay with 7 ships, 5 frigates, 1 corvette and 5 large transports; 5000 soldiers, commanded by General Maitland, were on board.

The English occupy the islands of Houat and Hoëdic and make them their base of operations. From June to September they turn aside upon Quiberon and Port-Navallo; but they do not dare to advance into the interior. In September the convoy sets sail for the Mediterranean; the expeditionary corps has to take part in the expedition to Egypt.

For nine years England refrains from attacking our shores; but in 1809 she hopes to be able to seize Antwerp while the whole French Army is still in Austria. In the hands of the French, this port took on a considerable development; the shipyards there were busily occupied, and the English feared lest this arsenal should become a dangerous base of operations against Great Britain.

The Antwerp expedition was perhaps the most important attempt every made to land by force in a hostile country. "The expeditionary fleet comprised 39 ships, 25 frigates, 31 corvettes, 5 bomb vessels, 23 gunboats, 59 small vessels and 82 armed launches. The number of transports was from 400 to 500, carrying 50,000 men, several thousand horses, artillery, ammunition, material and supplies. The fleet was placed under the orders of Sir John Strachan; Lord Chatham, the elder brother of the celebrated minister, was commander-in-chief of the land and sea forces.

The fleet appeared off the mouths of the Scheldt on July 29, 1809; on the 31st 15,000 men were put on shore on the island of Walcheren: it was important to secure possession of Flushing before marching on Antwerp. Middleburg, the capital of the island, was easily occupied; then Flushing was invested by land and sea. After a three-day bombardment, the place capitulated on August 16.

A fortnight had already elapsed.

There remained nothing more to do but to transfer the 40,000 men to the mainland and march upon Antwerp, but Lord Chatham could not make up his mind to do it: it seems that the hazards of all such enterprises only become apparent on the spot.

The troops re-embarked; the expedition returned to England, leaving a garrison of 12,000 men in Flushing.

In the month of December the island of Walcheren itself was abandoned.

This venture cost England the small sum of 625,000,000 francs; she lost in it 4000 men, and 10,000 others returned sick.

The coast of France was decidedly too well guarded: thereafter, to give her army a part in operations against France, England will land them in a friendly country.

To sum up, during the wars of the Revolution and Empire, attacks against the coasts were never systematic; the enemy only took advantage of opportunities that seemed to him favorable, such as the treason of the Toulonese, Paoli's insurrection in Corsica, the royalist disturbances in Brittany, or, finally, the Austrian campaign; he preferred to devote himself more particularly, when he had secured command of the sea, to the conquest of our colonies, which did not present the same elements of resistance.

* * *

All these details are not without use; what actually happened alone can give us knowledge of the enemy's aspirations, furnish us with an exact idea of the dangers that France has incurred, and reveal to us the best methods of attack and defense.

For two centuries England has essayed against our coasts everything that the passions of war can suggest to an unscrupulous people. We have a right, therefore, to assume that a nation which wished to recommence the same system of war would be naturally led to employ the same methods.

From another point of view, it is striking to see the same names always reappearing; it is observed that the enemy, after having failed on the mainland, is irresistibly drawn to islands, or rather to a particular one: Belle-Isle;[*] and from this aggregate of facts we can draw very precise conclusions.

It would have been possible to find other examples elsewhere than in our history; but they would not have offered the same interest, because the situation appears in a different light in each country, according to its military organization, the development of its means of communication and the geographic conditions.

We shall now examine the question of the attack and defense of coasts under three successive aspects.

[*] Let us hope that this indication will not be lost sight of.

We shall first seek to ascertain the degree of resistance offered by coasts left to themselves; then we shall study the effect exercised by naval forces upon their protection, setting aside their own means of defense; and last we shall deduce the method by which the action of shore defenses ought to be combined with that of mobile defenses in order to secure the best system of protection.

We have been able to note that the enterprises directed against our shores consisted at first almost exclusively of landings (1627-1694); then came the era of bombardments, which lasted scarcely three years (1694-1696) and was followed by a renewal of landings. They retain this last form.

LANDINGS.[88]—In two centuries our shores had to endure more than twenty invasions. Each of these expeditions required a considerable display of military forces; the number of troops varied from 5000 to 11,000 men (it was even greater on some occasions), necessitating a great many transports.

What was the result of these immense armaments? Whenever the enemies find a resolute man facing them, they suffer a repulse or even a veritable disaster. Usually they re-embark without even attempting to contend with our troops; an inconceivable incapacity on the part of the authorities is necessary in order that they may accomplish some depredations without being molested.

The English (aside from the Antwerp expedition) seem never to have thought of seizing a foothold on the mainland: in all cases, save one (Cherbourg, 1758), they fail to accomplish the object of the expedition and content themselves with pillaging villages, trampling crops under foot and carrying off a slender booty. What is such a gain in comparison with the risks run and the expenses incurred by each expedition? Yet France, engaged in continental wars, could only oppose raw levies to England's regulars!

The sterility of all these attempts arises less from faulty organization or poor leadership than from the very nature of the operation.

An enemy who disembarks in a territory having such vast re-

[88] In this chapter we treat only of such landings on the coast as imply the possession by the enemy of limited forces. In another chapter we shall speak of expeditions whose object is the conquest of territories.

sources as those of France finds himself from the beginning in a difficult situation. The aim of the expedition is usually one of the centers of activity of our navy: Brest, Saint Malo, Lorient, Rochefort. These towns are more or less fortified, and landing under the guns of the place is an almost impossible operation: it has never been attempted. To put on shore and assemble in safety small army corps comprising infantry, artillery and sometimes even cavalry, there is needed a landing place devoid of all means of defense. The further the disembarkation from the objective point, the easier will such a place be found.

When the troops are on shore, an intrenched camp is established to protect the reembarkation in case of repulse.

All this takes valuable time which the defense takes advantage of to throw forces into the place and organize resistance. Thenceforth the object of the expedition is spoiled: from the moment that the assailant has failed to effect a surprise, he must renounce the hope of entering the town without striking a blow; he cannot undertake a siege, for he will be obliged to raise it after a few days to make head against troops coming from the interior.

As soon as the small army penetrates into the country, it is exposed to an encounter during its march with hostile forces whose numbers it is ignorant of: it marches towards the unknown. Each day that elapses, each stage of the journey that separates it from its landing place, renders its situation more critical; it does not know that its line of retreat may not suddenly find itself threatened.

These ideas weigh upon the mind of the commander and influence his decisions; evidence of the anxieties to which they give rise are found in all such enterprises, and some have had no other cause of failure.

Fearful of being cut off from the sea, growing weaker in proportion as he advances on account of the necessity of guarding his lines of communication, the enemy only marches with extreme caution. As soon as he learns of the gathering of troops, he regains his boats as quickly as possible, fortunate if he is not obliged to sacrifice his rear guard. On his return home, the poor villages that have been pillaged are transformed into great towns, and honor is safe. But if the result obtained is compared with the expeditionary expenses, the balance is uneven.

When the enemy, thanks to the foolishness of incapable leaders,

enters a town, as in the case of Cherbourg, he does not even think of maintaining himself there. He knows that at the end of a short time he will be attacked and he has not the necessary means at his disposal to put himself in a state of defense.

Looking at past events from a present standpoint, with exact knowledge of local resources, taking into account the improvised defense, we are tempted to judge severely the precipitate resolutions adopted by certain English generals: but let us not forget that if the latter sometimes beat a retreat before imaginary perils, those perils would have become real at the end of a few days; and by persisting they would have had the same fortune as Tollemache and Bligh. Even then France offered too much resistance for a handful of men to be able to put her in danger.

To-day an attempt at landing would have still fewer chances of success than in former times: the maritime towns are better defended; our military organization is out of all comparison with what it used to be; the railroads enable great bodies of troops to be poured into a single place in a few hours; the commanders of sections are no longer merely gentlemen, usually very brave, but little versed in the art of war; finally, our soldiers are greatly superior, in number and in value, to peasants armed with scythes, to militia and coast-guards.

The enemy who should attempt a landing, even with great forces, would be rushing upon certain failure,[*] especially if France were not engaged in a continental war and had the free disposal of her army.

In this latter case, far from fearing such operations, we ought earnestly to wish for them: the undiscerning terror inspired in many people by the contemplation of 40,000 English landing on Cotentin is hard to explain. After all, the principal, almost the sole solicitude, in wartime, is to find a favorable field of battle where the enemy can be crushed by numbers. The English, by landing on our territory, offer us on land lists that we vainly seek at sea, and yet we tremble at the idea! And some talk of conquering the whole United Kingdom with 150,000 men. If we hope to be able to be victors on English soil with limited forces,

[*] Naturally we assume that we shall oppose the enemy and not be content to escape from him. We are here studying operations of war; it is evident we cannot prevent the enemy from attaining his object if we permit him to do so.

we shall be very much more so on our own soil with unlimited forces.

There is no occasion, therefore, to be afraid of a landing on the mainland; but we shall make some qualifications respecting the islands that border upon our shores.

The situation then is no longer the same: resistance is limited to the local resources, and the enemy may have quite an exact knowledge concerning them; the assailant is no longer pursued by the nightmare of an attack from the rear; finally, the fleet is always near at hand and furnishes a more efficient protection to troops which operate near the shore.*

Nevertheless, save for one exception, none of our islands have remained in the enemy's hands.

The reason of this is as follows:

It is always difficult to effect a landing by force. The ships have not boats enough to throw on shore the whole expeditionary force with a single movement. The portion which sets out first is reached by the enemy's fire even before it has put foot ashore; when it lands it has to assemble and form for battle: there is a critical time during which the defense has all the advantages on its side in spite of the weakness of its available forces. The operation is not impossible, but it is always dangerous. It is evident, too, that on an island of small extent, where the landing places are few in number, an active watch can usually prevent a surprise. This circumstance has several times saved our islands. Yet landings have been made on them, and they will be made still more easily with fast vessels that can facilitate diversions; it must not be forgotten either that, with calm weather, infantry can land anywhere and so take in reverse the fortifications constructed by the defense in the vicinity of beaches to locate its artillery and shelter its sharpshooters.

If a landing has been effected in this manner, there remains for the garrison nothing to do but to shut itself up in a fort and stand a siege.

The island will not yet be taken: if resistance is prolonged, the

*In operations against coasts, the fleet never goes away until the affair is over. It is only in the conquest of territory over seas, which is accomplished with force sufficient to subjugate a whole country, that ships can abandon troops to their fate, and they only do so when the army advances into the interior.

enemy will tire of immobilizing troops and ships, the need of which elsewhere will make itself felt, and will withdraw.

Sometimes, moreover, the only object of the attack is to produce a moral effect by the ravages accomplished, without any idea of conquest. Groix, Houat, Hoëdic, Noirmoutiers, have thus seen their soil violated by hordes that passed over them without stopping.

It is not enough to take islands: it is necessary to retain them.

But ours are so near the mainland that they cannot be left in charge of a mere garrison without risking their loss; therefore they have to be guarded by naval forces. And then it is seen that the consequences of such an obligation are that the land depends upon the fleet for support, whereas the possession of the islands is only really advantageous if the ships can be supported by them. Of course squadrons will be enabled to anchor there, just as they might in a great many other places on our coast which are not defended; but they will never find there anything but alien and unsafe roadsteads.[91]

These considerations are not sufficient to justify leaving our sea-coast islands without defense; quite to the contrary, they should be given sufficient power of resistance for the enemy to say to himself that the effort required to seize them would be out of proportion to the advantages that he would derive from them.

But when one of our islands is invaded and its garrison besieged, all that will not prevent its finally succumbing if the navy does not intervene in time to put a stop to it.

Colonies may be likened to our coast islands in the sense that they also have but limited resources, but their distance from the mother country places them in a still more unfavorable situation. If the enemy commands the sea, they will fall into his hands whenever he is able to assemble forces sufficient to overcome all resistance: it is only a question of time and means. Once taken, they will never more be recaptured, since the communications will be cut.

Evidently, they can be safeguarded by making sufficient sacrifices to put them out of reach of any attack, but such sacrifices have a limit.

[91] It will be observed that Corsica was evacuated the moment the English fleet was recalled into the Atlantic; the English frequently sojourn at Houat and Hoëdic, but they abandon them whenever their ships go away.

Here again the intervention of the navy is necessary; we shall see further on what its nature must be.

Bombardments.—There can be no question here of bombarding undefended towns. It is evident that the material damages will depend solely upon the number of shell that the enemy expends in useless slaughter.[12] It may be observed, nevertheless, that it is not customary to throw the burden of war on defenseless centers for the reason that, such centers being unimportant, their destruction is of no interest as regards the settlement of the conflict. War is not made, especially naval war, to trouble the repose of peaceable citizens; a more lucrative result is sought, and, even were this result only moral effect, it can only be attained by attacking an important center, which is always provided with defenses. It was unpardonable negligence to have left Dieppe, where in the 17th century privateers fitted out, exposed to bombardment, without furnishing it with means of defending itself.

Bombardments have generally been occasioned by the fits of rage of a nation that wished to avenge the losses inflicted upon its commerce by privateers. Thus we have seen the English fall furiously upon Dunkirk, Dieppe and Saint Malo; thus France vainly tried, for two centuries, to burn the nest of Barbary corsairs at Algiers.

Sometimes the result has been insignificant; most often it has been *nil*.

Will it be otherwise nowadays?

Certain writers seems to take a malign pleasure in terrifying the sea-coast population by exalting the destructive power of modern explosives. Let us come to an understanding about this. When ships appear before a port, before sending into the town those great-capacity shell that are to reduce it to ashes, they must first engage in a regular contest with the shore batteries; they will turn all their fire upon the latter, for there is no example of ships receiving cannon shot and not turning against those who send them. Not until after the defensive works have been silenced can

[12] Yet the entire contents of the magazines of a squadron of ordinary composition would not suffice to destroy a city. See on this subject an extract from the *Mémorial de l'Artillerie de Marine* appearing under the title: *Des Opérations maritime contre les côtes et des débarquements*, by M. D. B. G.

the task of destruction be undertaken—provided there remain shell in the magazines.

We will seek, therefore, in the most recent wars for indications as to the efficacy of a contest of ships against coast batteries.

During the war between China and Japan, the Japanese ships contended in a spiritless manner and at long range with the works at Port Arthur and Wei-hai-wei. The Japanese had, nevertheless, in both cases, a deep interest in destroying the sea-front defenses, because they were seeking to get into the interior of the harbors to second the operations of their army.

They secured no result.

The Americans were no more fortunate: at Matanzas, Cabañas, San Juan and Santiago, the coast batteries endured, almost without replying, the fire of the ships and were none the worse for it.

It is probable that if the Japanese and Americans had really wished to destroy the works, they would have succeeded, because the armament of the shore batteries was composed only of old-fashioned guns and their gunners fired as badly as the enemy could desire; but in that case it would have been necessary to engage seriously and to enter upon a combat at point-blank distance;[88] but, if the expression may be pardoned, the game was not worth the candle. The Japanese, as well as the Americans, had need of their ships and their ammunition; they did not at all favor exposing the former and using up the latter for a problematic result. Their prudence would have been still greater if the batteries had been armed with modern guns and served by real artillerymen.

The Americans certainly cannot be accused of having shown excessive sensitiveness during their last war. Yet it has not been sufficiently remarked that Secretary of the Navy Long enjoined upon Admiral Sampson, who had charge of the blockade of

[88] Shore batteries offer only a very small target; and to dismantle them it is necessary to hit each separate piece. In order to avoid receiving hard knocks, the ships are led to oppose to each battery a crushing superiority of fire in order to prevent it from firing, and to fight at short range. But when they have affair with the works of an important place, whose lines of fire cross, the contest becomes dangerous, and the attack prefers to get around the difficulty by taking the batteries from the rear by means of a landing. That is how the Federals usually acted in the American Civil War, the Japanese at Wei-hai-wei and Port Arthur, and the Americans at Santiago.

Cuba, never to engage coast batteries armed with heavy guns, and only to attack others for the purpose of getting at vessels that they were protecting.[84] If we may judge from one of the American admiral's letters, he would not have been sorry to give voice to his guns to break the monotony of the blockade; but his government thought, with good reason, that there were only hard knocks to receive, and no benefits to gain, from a contest with even badly served and poorly armed batteries; and that it is useless to squander valuable ammunition so long as there remains hope of using it against the enemy afloat. This calculation was rigorously exact: after the destruction of Cervera's squadron, peace had to be made.

By a singular contradiction, while the American authorities adopted so wise a measure, the sea-coast population of the United States was obsessed with the idea that the Spanish squadron might appear off their shores. Yet what harm could the entire contents of the magazines of four cruisers do to the fortunes of the United States?

Finally, the part played by bombardments in the Russo-Japanese war is still more insignificant than in previous wars. Admiral Togo had better to do than to expend his ammunition against the batteries of Port Arthur, and he contented himself with an exchange of a few shots at long range.

It seems that the point of view adopted by the American and Japanese governments will likewise force itself upon every naval power solicitous of obtaining the best return from its forces. Ships will not be risked against batteries before the hostile fleet has been completely destroyed; and when this result has been attained it will be preferred to take the forts from the rear, by landing troops, rather than to attack them with ships from the front. This consideration affords us a just measure of the dangers run by sea-coast towns; and we are seized with pity when we learn from Cervera's correspondence that this admiral, placed at the head of his country's principal naval force, saw no better use to make of it than devoting it to the defense of the Canaries, while his minister leaned rather to Porto Rico.

At the present time bombardments are good only to intimidate half-civilized peoples. A great moral effect can then be discounted

[84] Why then was the useless bombardment of Porto Rico ordered? Do we not see there again a yielding to public opinion?

with a small material result; but this method will only be employed against nations that have no navy, because it will often be the only way of reaching them. Moreover, every one knows that the ammunition supply of modern artillery is excessively costly, and yet scanty: squandering ammunition in operations that do not advance at all the settlement of the conflict will, therefore, be avoided.

We would certainly have less apprehension of bombardments if, instead of always reckoning up the harm that an enemy could do us by attacking our coasts, we turned the problem around. We would then ask ourselves what one of our naval forces could do if it were given the mission of "insulting" the enemy's shores. Whoever was charged with this thankless task would not fail to represent the danger of such an operation and the small benefit that it would procure. These considerations would bring the importance of bombardments down to its true value.

Let us, therefore, provide our great naval centers with coast batteries; let us keep light vessels out of the docks by booms protected by rapid-fire guns; let us even plant lines of torpedoes at the harbor entrances: then if the enemy appears he will know what the cost will be.

THE INFLUENCE OF NAVAL FORCES ON COAST DEFENSE.—In all that precedes we have supposed the coast to be left to take care of itself. We will now inquire how naval forces can contribute to the protection of a coast without land defenses.

The influence of naval forces is very clearly shown by the history already set forth: it can be summed up in two words:

So long as the squadrons keep the sea, so long as they show themselves, the coast enjoys absolute tranquillity.

As soon as the squadrons disappear, whether because they have been destroyed, or because they operate in another, far-distant region, the coast is attacked.

In the colonies this characteristic has been less clearly defined, because the intermingling of English and French possessions permitted landing troops on the islands unexpectedly; but it subsists in a general way.[86]

The mere fact that "war is being carried on" is, therefore,

[86] See in the Second Part, in the paragraph on "The Offensive and the Defensive," the character of our naval wars.

sufficient to create a powerful enough diversion to turn aside the enemy's attention from the coast, because he is urged seaward by more powerful interests; but since the introduction of steam this guarantee has seemed insufficient, and it has been demanded of the navy to devote itself more directly to securing the safety of the coasts. From this period date the creation of a special material and the birth of new conceptions as to the employment of naval forces.

If we may judge from the nature and distribution of part of our ships, from the majority of naval writings and from the themes of our grand maneuvers, protection of the coast can be assured at the present time:

1st. By torpedo-boats.

2d. By coast-defense vessels, either distributed singly in the ports, or grouped in divisions.

3d. By squadrons assigned to the protection of a fixed stretch of coast.

We will examine successively each of these systems, which may be employed together or separately, and deduce from this examination their efficiency.

PROTECTION OF THE COAST BY TORPEDO-BOATS.—It is easy to prove that, with the speed of modern vessels and the rapidity of fire of their guns, a squadron can appear by day off a port, empty its magazines and put to sea again without having anything to fear from the torpedo-boats of the local defense.[*]

Protection of a port by torpedo-boats is more difficult to realize than is supposed. During the grand maneuvers cruising grounds are established in the approaches to the central station of the mobile defenses: but this is a solution that can only be used for a few days: it will become impracticable as soon as hostilities have a duration of several months; in our opinion, it is a bad utilization of the torpedo-boats. Little by little this continued effort will use up the boats, and when there is need of them they will not be available. Even disregarding the unfitness of coast-defense torpedo-boats to keep the sea continuously, it is not reasonable to put mobile forces on permanent guard duty in anticipation of an event that may never happen; on the one hand, attention ends by tiring and they let themselves be surprised; on the other, the return

[*] The Japanese squadron furnished proof of this for ten successive months.

is too insignificant. When the presence of the enemy is signaled, *all* the torpedo-boats should be sent out and go to seek the enemy. While waiting, the boats should be kept in practice and exercised without undue strain in order to have them all in readiness.

But it is probable that the enemy will surround his intentions with a cloud of doubt, and that his appearance will be unexpected; he will thus have a very good chance of not meeting torpedo-boats on his route.

However, to conform to the established rules, we will suppose that there are always torpedo-boats at sea, and even that, by a happy chance, they are all outside on the night that precedes the attack.

Their scouting zone will necessarily be quite close to the point to be defended; for, as they increase their distance from it, the space to be covered increases rapidly and quickly becomes so extended that the guard is inefficient. In all probability the torpedo-boats will not be more than 10 miles off shore: to make every allowance, let us put it at 20 miles.

It will be sufficient, therefore, for the enemy to appear before the port less than two hours after sunrise in order to preserve himself from a night attack."

Two hours later he will have emptied his magazines and will put to sea again.

His speed will perhaps then be reduced on account of injuries to his ships; but he will be careful not to depart before stationing his destroyers on guard so as to prevent the torpedo-boats from coming out at least until night-fall. If the latter succeed in then escaping, the enemy will have had such a start that he will long have been out of reach.

This is not all.

Operations against the coast, of the kind that we are considering, are never of an urgent nature, since it is sure that the land will not move away. Therefore, favorable conditions will be waited for: if it is known that the torpedo-boats come out regularly at night, an attempt will first be made to cut them off from their refuge by means of light vessels: the destruction of all of them doubtless will not be attained to, but those that escape will become more cautious and will no longer dare to separate them-

" This will even be an excess of precaution, since the torpedo-boats always return to their port at daylight so as not to be caught at sea.

selves from the immediate vicinity of the entrances; this accomplished, there will be chosen for the attack preferably short nights, of full moon, and finally weather ill suited to small boats.

It will only be necessary for part of these conditions to exist in order to remove all apprehensions on the part of the battleships.

There would be danger for them from torpedo-boats that, setting out from ports very far off, and therefore not under watch, might come to wait for them on their return passage; but our mobile-defense torpedo-boats have neither endurance nor radius of action enough to undertake raids of this sort.

As a matter of fact, in the numerous exercises of coast attack that have been carried on in recent years, torpedo-boats have played but a small part.

I am not at all seeking here to depreciate the value of torpedo-boats; I believe, on the contrary, that, if employed judiciously, they can to a certain extent make up for the inferiority of our squadrons: I am merely finding fault with the defensive part to which they have been condemned. In order that they may do justice to the torpedo, the enemy ought not know their number, their customs, or where they are to be found: on the contrary, they should attack without premeditated plan, which amounts to having offensive torpedo-boats capable of going to look for the enemy wherever he may be.[*]

Under the pressure of public opinion we have built two hundred coast-defense torpedo-boats, and we have distributed them from Dunkirk to Villefranche, from Oran to Bizerta, seeking thus to assign to each place a part proportional to its importance, so as to content everybody. Even this does not suffice; for, once entered upon this way, there is no reason to stop; thus we have read newspaper articles demanding torpedo-boats as far as in Boû-Grara sea.

The consequences of this singular strategy will not be long in making themselves felt.

The war will not have the same intensity everywhere: it will be localized in certain regions, because the number of squadrons is

[*] The movements of sea-going torpedo-boats ought to be combined with those of squadrons, because, as soon as a torpedo-boat puts to sea, it needs to be supported in day time by a force that prevents its being captured by the hostile cavalry, that is by cruisers.

limited and the enemy is not interested in attacking the coast at all points at once—if he even attacks it at all.

Admitting that torpedo-boats have in the direct protection of the coast an efficiency which we do not deny to them, it will only be those in the immediate vicinity of the point attacked that can be utilized. All the rest will remain inactive and will be mere spectators of the events that occur far from them: when the war is over, the greater number of them will not have fired a single torpedo.

And then the same men who, during peace, were the first to preach the distribution of our torpedo-boats, influenced by unreasoning fear, will cast stones at us and accuse us of not having known how to make use of our forces

And this time they will be right; for our first duty is to utilize our vessels.

PROTECTION OF SEA-COAST TOWNS BY COAST-DEFENSE VESSELS AND ARMORED GUNBOATS.—The French Navy has the good fortune to possess an important number of coast-defense vessels and armored gunboats. It has been proposed to utilize them by making them assist in the defense of places. This proposition has even had a beginning of execution, since we find the *Fusée*, *Mitraille* and *Phlégéton* at Bizerta, the *Styx* and *Achéron* at Saigon; but yesterday the *Flamme* was at Dunkirk, and it is pretended that in time of war nothing better than that could be done.

These vessels have only one or two heavy guns; they are, therefore, only floating gun carriages of enormous cost, expensive to maintain, and of much greater vulnerability than a sea-coast cannon, since it is only necessary to damage the vessel to put out of action the gun it carries.

If all the guns that defend a great maritime place are enumerated, it will at once be seen that the battery of a coast-defense vessel will be but an insignificant addition to the defense and will not compel the enemy to modify sensibly the composition of his forces. It is, therefore, the mobility of this floating gun carriage that is counted upon to justify the presence of a naval unit in the midst of shore batteries.

The advantages given by ability to move about are not evident in the actual case. If the coast-defense vessel wishes to go out from the narrows, it separates itself from the land defenses and concentrates upon itself alone the fire of all the ships; therefore,

it cannot venture out to sea without exposing itself to being wrecked, and its propeller serves to take it into port rather than for anything else.

The assignment of coast-defense vessels or armored gunboats to the protection of harbors amounts to turning naval funds over to the war department. The land defense does not get from this lavishness a benefit proportional to the millions such vessels represent; with the same sum it could have obtained much more important results. On the other hand, the navy's loss is a total one: its offensive strength is diminished by an equivalent quantity.[*]

Since these vessels will bring to the defense of places only a trifling aid, let us inquire what better disposition can be made of them.

Concentrate them in a single body. Place this body in the neighborhood of a strait frequented by the enemy, since their lack of radius of action and of nautical qualities does not permit giving them an extended field of action. We will thus have at our disposition a very considerable force. The enemy must hold it in check by opposing to it an equal or superior force; and we shall thus have immobilized a certain number of vessels and so will not find them confronting us on another field of battle or before our ports. The situation will not even then be brilliant, but it will be better than it was. This concentration will contribute more efficiently to the protection of the shore than would distribution in several ports.

If, in place of this squadron of limited steaming capacity, we had offensive ships capable of being utilized under all circumstances, we would immediately perceive a series of new combinations made possible by this additional force. We could thus more easily drive the enemy from our coasts. Moreover, we would have increased our offensive power without at all diminishing our defensive power.

It was reserved for America, the inventor of the coast-defense vessel, to be the first to make proof of its inefficiency.

The needs of the war with Spain revealed to the United States that it is dangerous to construct a special material adapted for a

[*] Evidently the commander of the section will not reason in this way. Each one, in his sphere, sees only the immediate interests of which he has charge, and as regards the defensive one always thinks himself not sufficiently safe: but that is not the question.

particular form of war, because operations cannot at will be given a fixed character. Actually, America only succeeded in having superiority over the Spanish by taking a number of monitors away from their original application in order to reinforce her squadron. Then it was perceived that they were troublesome and might become dangerous. Their unfitness to meet the conditions of war was such that Mahan wrote in regard to them:

"In the recent hostilities we had 26,000 tons tied up in monitors of comparatively recent construction, in the Atlantic and Pacific. From the beginning to the end, I venture to say that there was not an hour when we would not willingly have exchanged them all six for two battleships of moderate displacement."[100]

To-day we no longer need to fear seeing our fleet increased by new samples of this sort; but doubts subsist as to the best use that can be made of those we have. Whatever there may be attempted to get from them, we may boldly assert that their distribution among several ports is the method by which they will yield the least return.

We also have a lesson to take to heart from the presence of these bastards in the list of our war ships. It is clear that we only undertook the construction of our coast-defense vessels in imitation of America and Germany, and that not until after having built them did we inquire what use could be made of them. Is the French Navy so ignorant of the needs of war as to be reduced to seeking direction from her younger sisters? If our neighbors make an error, that is not a reason for imitating them. It is necessary to know what one is doing and why one does it; without that one is exposed to entering upon a war without having the means of waging it.

DEFENSE OF THE COAST BY SHIPS GROUPED IN DIVISIONS.—This system, which we find advocated in *Les Guerres navales de demain*, is the most perfect application of the fatal method of doing things piecemeal. We refer to it, although it is already a thing of the past, to show clearly to what aberrations absence of a sound doctrine can lead. This is the use made of it by the author:

He stations at Toulon, Marseilles, Cette, Bizerta, Bône, Philippeville, Algiers and Oran, divisions composed of battleships and

[100] It is known that the coast-defense vessels had to be towed in order to go to Porto Rico and that their replenishment was a constant source of anxiety.

cruisers;[168] and that accomplished, the author thinks he has assured France's preponderance in the Mediterranean.

If we go back to the period when this original plan was conceived, we observe with pain that its materials were furnished, as far as armored ships are concerned, by all the naval forces of France except three new battleships and three station ships.

Let us now note the consequences of this plan.

England cannot imagine a distribution of forces that would be more favorable for herself: this scattering of our forces is such as would result from a battle lost, followed by a rout. No one of these divisions is a source of annoyance to a squadron that remains concentrated; not one has sufficient strength to constitute by itself alone a serious danger. The English squadron, therefore, is mistress of the Mediterranean. That is something; it is even all that is asked. Nevertheless, it cannot quit its field of action, for, if it went away, English interests would be compromised.

Not finding himself confronted by any immediate adversary, the enemy would seek to utilize this inactive force, and, as has happened whenever a condition of this sort has existed, he will be drawn towards the coasts. We will then suppose (though it is far from incontestable) that the disposition of our forces has an absolute efficiency and forbids any attack upon the cities where our divisions are.[169] The enemy, moreover, has something better to do than empty his magazines upon our shores.

He finds himself opposed to a very extended line of defense. Naturally he will not divide his forces to attack everywhere at

[168] At Toulon: *Trident, Océan, d'Estrées.*
At Marseilles: *Richelieu, Friedland, Colbert, Dupetit-Thouars, Papin, Linois.*
At Cette: *Achéron, Mitraille, Fusée* (3 guns in all).
At Bizerta: *Courbet, Redoutable, Dévastation, Sfax, Forbin, Davout.*
At Bône: *Terrible, Dragonne.*
At Algiers: *Baudin, Formidable, Troude, Bombe, Dague.*
At Oran: *Caïman, Milan.*

[169] It is very difficult, from the tactical point of view, to combine the action of ships with that of batteries; in practice, the first will be led to move in line close to the port with broadsides bearing; and, as they have only been placed there to make up for an insufficient land defense, they will support the principal effort and receive the fire of a double or triple force without being able to profit by the advantages given by mobility.

once; he will take the weak points. Well, at one of the extremities lies Tunis. It constitutes a guarantee worth taking and even keeping; and it does not dispose of the same means of resistance as France, or even Algeria.

A day will be enough to take 12,000 men at Malta and land them safely on one of the numerous deserted beaches that are available to the invader, or even at a port like Sousse. The sole precaution needed will consist of paralyzing the divisions at Bizerta and Bône by means of detachments of superior force.

When the enemy has put foot on the soil of Tunis, perhaps then it will be recognized that the best means of saving our colony is to cut off his retreat by destroying his squadron. Then the reunion of all our scattered forces will be thought of—that is, we will end where we should have begun; but the concentration will present insurmountable difficulties, the enemy holding interior lines; and it will suffice for one or two divisions to be crushed in detail for all hope of fighting him to advantage to be lost.

Thus this initial dislocation, whose object is to protect the coast, will attract the enemy there for the very reason that, not being solicited in another direction, he will have nothing better to do.

PROTECTION OF THE COAST BY SQUADRONS.—We come now to the favorite theme of grand maneuvers: the assignment of squadrons to the guard of a fixed stretch of coast. Enough experiments of this kind have been made to enable us to draw precise conclusions from them.

This is what takes place:

As soon as hostilities are declared—I mean from the very beginning of the maneuvers—the defense squadron gets under way and promenades along the coast like a sentinel along a wall. The enemy, who comes from seaward, has it watched by his scouts, and, when it reaches one of the extremities of its zone of surveillance, attacks the other. His presence is at once signaled to the defense, which turns about—and arrives too late.

It arrives too late because it has a great extent of coast to guard, and it cannot be everywhere at once.

The day after, the enemy appears at another point; and this game of hide-and-seek lasts as long as the maneuvers last.

Sometimes the defense, tired of playing this part of dupe, divides its forces; it commits then a serious error that only the

make-believe of the maneuvers excuses; for, if the enemy has remained concentrated, each fraction is endangered.

In an exercise of this kind the coast-defense squadron will never succeed, and never can succeed. The navy must not be asked to perform the impossible.

The result would perhaps be completely different if the data of the problem were more general.

Instead of making it the objective to prevent the enemy from approaching the coast, the aim should be limited to destroying him if he appears.

The coast-defense squadron would then maneuver in another fashion.

As soon as it learned of the enemy's approach, it would put to sea and having taken position on his line of retreat would wait for the attack to define itself.

Warned at once by scouts left in the ports, it would endeavor to cut the enemy off and bring him to a stand between itself and the coast.

If the enemy waits to bombard a port, he contributes to his own defeat; the time that he loses gives the defense time to come up and force him to an encounter that his expenditure of ammunition and his injuries would make disastrous. But, to succeed, the defense needs, just as much as the attack, speed and steaming radius; while it is always assumed—I know not why—that on the defensive side these two factors can be sacrificed.

It is unnecessary to conceal the fact that this discussion has only a platonic interest. It is always supposed, in the grand maneuvers, that the defense is stronger than the attack: it is a quite conventional supposition. On the one hand, the enemy, if he knows he will meet superior forces, will take care not to come to throw himself into the wolf's jaws; on the other hand, when one is the superior, the idea will not occur to him to immobilize his ships to await an enemy whose every interest is not to come. On each side, therefore, there will be agreement to adopt another solution.

The reality—the sad reality—is that a squadron assigned to the protection of a fixed extent of coast and constituted, as is generally supposed, of ships few in number, ill armed, and having but little speed and a small radius of action, is condemned in advance to inferiority, and consequently to destruction. It, therefore, de-

fends nothing. The attack, in truth, may adopt two procedures: either it will make two parts of its forces, of which one will act against the shore, while the other will combat the coast-defense vessels; or better, it will remain concentrated and will first get rid of the ships; after which it will turn against the land. In the first case the attack on the coast accompanies the destruction of the floating defense; in the second, it follows it; in neither case is it prevented.

How is the unfortunate coast-defense squadron to escape from the fate that threatens it? Its separation from its base of operations will be waited for, to crush it; and as armored ships, even coast-defense vessels, cannot enter the majority of commercial ports, their want of speed will force them passively to receive attack.

There remains the resource of shutting themselves up in a port. This is not a solution: the navy has not expended hundreds of millions in building ships to shut them up in the strong-box of a naval arsenal; it requires dividends from them. Moreover, public opinion would at once force our squadrons to sea when the enemy, by a feint, has made an appearance that masks his real strength. Our squadrons will be uselessly sacrificed.

THE UNFITNESS OF SHIPS TO GIVE DIRECT PROTECTION.—It will doubtless be judged that ships give proof of singular ineffectiveness. Fortunately nothing of the sort is true.

It is not the ships that are ineffective: it is the proposed method of using them that is defective.

It is proposed to condemn them to give direct protection by placing them between the coast and the enemy. We find ourselves then faced with a new application of the defensive that is worth no more than the rest. One kind of vessel only would be fit to make it effective: that is the submarine. And this for two reasons: first, because it is invulnerable; second, because it cannot be combatted with elements of the same nature. But considerations that we shall presently examine into will show us that only a moderate use of submarines is necessary for the protection of the coast.

The defensive upon the sea is the exact opposite of the defensive on land.

The army is concentrated within the frontiers to await the enemy; the navy is obliged to crumble its forces *outside* the sea

frontiers. The defensive on land occupies, so to speak, the center of a circle whose circumference the naval defensive would occupy. One acts by interior lines; the other by exterior lines.

This comparison reveals to us the dangers and difficulties of direct protection.

The disposition along the coast lets the enemy know with almost perfect accuracy the number and composition of the forces he will find in each center of defense; there is, therefore, no longer anything unexpected for him. Free to keep off, he will only attack when he has brought together destroyers and ships in sufficient numbers to have an overwhelming superiority.[108]

In a word, to have superiority, it would be necessary everywhere to offer resistance with forces at least equal to those that the enemy can collect at a single point: which is impossible. A squadron taking with it twenty destroyers will have enough elements to provide against our two hundred coast-defense torpedo-boats, since it will only have to do with one single mobile defense at a time.

In practice, only limited means are available in each region. If they are scattered, the protection is very weak and becomes ineffective; if they are concentrated, the greater part of the territory is exposed and the protection is unreal. It is turning in a vicious circle.

The complete organization of direct protection for the coasts of France and her colonies would require, to be efficacious, expenditures that are in contradiction of the defensive idea. The English naval budget would not be enough for it. That is why submarines should only be used for coast defense to a moderate extent; so long as we have hopes of letting them loose against the enemy, we ought to employ them without any thought of the defensive.

Direct protection can only be practised by elements whose value does not depend, to the same degree as that of ships, upon numbers, and whose moderate cost does not task too heavily our budget: such elements are constituted by *fixed defenses.*

[108] It has been concluded from this situation that England, in spite of her formidable navy, will never succeed in effectively protecting her coasts. There is no reason to suppose that she will adopt a procedure so manifestly ineffective as that of dividing her squadrons: that would be contrary to all her traditions. It would be imprudent to found hopes upon an error that, in a French-English duel, we alone have wished to commit.

PROTECTION OF THE COAST BY THE OFFENSIVE.—As far as naval forces are concerned, they can only furnish the coast with indirect protection by turning aside the enemy's attention, that is by taking the offensive.[104] This method has succeeded in the past; there is no reason why it should not do so in the future.

And, by reflecting upon the matter, it will be seen that this system of protection must be efficacious. In order that it should be otherwise, the enemy must seek to deceive the vigilance of the forces that are watching him, to make a dash at the coast. What will then be his situation?

If a landing is contemplated, the ships and the troops they carry are bound together; so long as the expeditionary corps operates on shore, the ships are obliged to remain in its neighborhood to support it, furnish it with reinforcements, watch over the safety of the transports, and in case of need protect the re-embarkation. What sort of a squadron is it then that will expose itself to attack under such unfavorable conditions? Yet it is this with which it is threatened. It is engaged in an operation of uncertain duration; it, therefore, risks giving the enemy time to come up, even from a great distance, and to surprise its ships in an undefended anchorage, stripped of part of their forces; or to be met on their return voyage, encumbered with troops and embarrassed by a convoy. During the grand maneuvers, this chance can be taken, because then the duration of the operation can be abridged at pleasure, *and above all because there is certainty of not being destroyed;* but in time of war, it will not be attempted without a great deal of reflection.

If a bombardment is contemplated, the aggressor finds himself in a position none the better.

The operation in itself can be rapidly carried out, and it may be hoped to finish it without hindrance. But afterwards? It will be necessary to turn back with magazines empty, with ships dam-

[104] What constitutes the defensive strength of a fortified place is that the garrison is sheltered behind breastworks or in forts. If it was attempted to defend a city by stationing the garrison outside the walls, so as to interpose between the enemy and the point to be defended, nothing at all would be protected, since it would suffice to assemble a force more numerous than the garrison to drive the latter away. To pretend to defend the coast by interposing ships between the coast and the enemy is equivalent to defending a place by making its garrison go out into the open country.

aged; here again it would be madness to contemplate an encounter. In both cases, a very powerful motive would be necessary to justify risking one's squadrons in such a venture; but there is no such motive: attacking the coast does not lead directly to the ends of war.

Fleets, like armies, are the only instruments that have hitherto been able to decide the disputes that divide nations. From the day when ships ceased to play the part of a bridge by which to cross arms of the sea, and became deadly weapons, the whole interest of war became fixed upon them; they became a menace that can only be escaped by destroying them. That is why they attract to themselves the hostile forces. The struggle between elements afloat is, therefore, a necessity from the first. So long as this quarrel is not settled, the coast will remain in peace, and *we have no right* to compromise the issue by detaching a part of our fleet to stand guard over our shore; all the ships ought to participate in the operations. It will always be time to bring them down to the coast afterwards if fortune betrays us; but it is to be feared that they will then be unable to raise our prestige and that our loss will be irremediable.

It is a grave error to believe that the offensive has not a direct and immediate effect upon the defensive, to imagine that one can with impunity disregard what is going on on the sea to use all his exertions on shore. This error has led to looking upon naval warfare as merely a succession of disconnected operations, to devoting part of one's forces to offense and part to defense, without its being perceived that in this way the former is endangered without the latter being made safe. As if the best way of defending oneself has not always been to attack.

This policy has given us what may be called the fleet of "the public folly": eighteen coast-defense vessels and two hundred mobile-defense torpedo-boats that are tied to the shore by lack of steaming radius and sea-going qualities. It must be confessed that so large a share has been given the defensive that any offensive becomes impossible.

There are not, therefore—or rather there ought not to be—two distinct fleets, one fleet for attack and another fleet for defense. There is but one of them, whose objective is the enemy afloat, and which puts in action all the resources of strategy to beat him, without looking back to see what is happening to the coast.

To continue the comparison between land and sea operations, we will say that on the sea the offensive contributes to the protection of the coasts to the same degree that the offensive on land contributes to the protection of the frontiers. As soon as the army penetrates into the hostile territory, it secures efficiently the protection of its own territory, and renders useless all the defenses of fortified places; the latter no longer have to guard themselves except against surprise attacks.

The foregoing is what we wrote in the first edition of this study, before the Russo-Japanese war. To-day, after a recent experience, we have nothing to change in it. The offensive played the same preventive part during this war as in the past; and it could not be otherwise, for the influence of naval forces derives from the very nature of war.

INDIRECT PROTECTION.—Indirect protection is, therefore, the only kind that is suitable to sea forces; it is also the only logical kind, because it leaves to the navy its freedom of action in carrying on the war. It forms neither a barrier nor an obstacle, and for that reason its efficiency is not clearly apparent unless pains are taken to disengage it from the teachings of history. It does not oppose the enemy's undertakings: it threatens to interrupt them or to make him pay dearly for them. It inspires a fear like that of the policeman, who does not prevent robberies, but arrests the robbers. Just as civil society has found no better means of guaranteeing property than by inspiring a salutary fear in those who wish to assail it, so military society can only guarantee itself against certain eventualities by making the enemy run risks greater than the damages he can cause.

This solution is not absolute—who can flatter himself to have given such to any problem of warfare?—but any other would be less good.

Evidently, the anxiety to find a favorable field of battle may force us to abandon completely certain regions. An *Augusta* may profit by it to appear on our coast, but that will no more compromise the issue of the war than a cavalry raid compromises the issue of a campaign. It may even happen that a more important force will come to threaten us, though this is much less probable, since, when the enemy is kept on the alert, he has neither desire nor leisure to attack the coast. But, against such incursions, the coasts will not be stripped bare; they will have, to defend them,

batteries, booms, lines of torpedoes and, if the war is exclusively naval, the whole French Army. With similar means France has for two centuries repulsed—not unsuccessfully—attacks more dangerous than those with which a maritime nation can threaten us; for at that epoch the defense of most of our sea-coast towns was only in embryo, and our army was always occupied elsewhere.

And if these means did not suffice, if a few houses were destroyed, some villages burned, some harvests trodden under foot, it would not be necessary to cry abomination of desolation: war is not made without receiving blows, the whole thing is to give more of them than one receives, and above all to strike home. Well, if we strip a part of our coast to carry the theater of war onto a distant field, it is because usually—not to say always—we anticipate elsewhere a superiority that will assure us victory. The enemy, in taking advantage of the momentary freedom of the sea to attack our shores, therefore plays our game; in exchange for material damages, he renounces a decisive result or gets himself beaten. What do bombardments and invasions amount to then? The dead are replaced, the losses are made up; one thing alone is irreparable: the ruin of the fatherland.

And we will conclude: the best way to protect the coast is still to combine the direct action of fixed defenses with the indirect action of squadrons.

PROTECTION AT A DISTANCE.—When possession of a territory is of capital importance, either temporarily or with a view to the future, and this territory is not in condition to defend itself, it becomes necessary to protect it with ships. In truth cases of this sort are extremely rare: it is generally better to restrict oneself to bringing the adversary to an agreement rather than to expend one's forces in piecemeal attacks. When the time of settlement arrives, demands are limited only by the degree of helplessness to which the enemy is reduced. But after all the event can happen, and the best example of it is certainly the defense of Gibraltar by the English. Let us see how they went to work to preserve their new conquest, without suffering the dangers of direct protection.

The Spaniards, having committed the error of leaving a garrison of only 150 men in Gibraltar, Admiral Rooke had seized it by surprise. The English government recognized the importance of the position and resolved to retain it at any cost. But to put the place in a state of defense required extensive works and in the

interval until they were executed, although the rock could be put out of reach of a surprise, the fleet alone could preserve it from a prolonged attack.

The English squadron, commanded by Leake, took Lisbon for a base of operations. It is probable that this port was only chosen in the absence of a nearer one; but events proved that in spite of its distance, or rather on account of it, the protection was effective.[199]

In fact, so long as Leake's forces were not put out of action, the capture of Gibraltar by sea was impossible. The garrison, knowing that it would receive assistance in the course of time, would hold out until the fleet arrived; and the latter, finding the besiegers engaged in combined operations, could inflict defeat upon them, even if inferior in numbers. It was necessary to station off Lisbon a covering squadron at least equal in force to that of Leake, which required a deployment of forces that France was incapable of accomplishing; or to destroy the English squadron first and then attack Gibraltar. But how could ships inside an inaccessible roadstead be reached?

The English fleet, established at Lisbon, therefore really protected Gibraltar; it did not accomplish indirect protection, but protection at a distance.[200]

The French government did not appreciate this situation. Relying upon the absence of Leake's fleet, it paid no attention to it and sent Squadron Commander de Pointis to Gibraltar to aid with his ships the land operations directed by Marshal Tessé.

Did Pointis comprehend the danger he was going to run? It may be doubted, since he accepted the mission. Things are often not seen in their true light until after arrival on the spot. However this may be, when he reached Gibraltar he perceived the difficulties of his task and wrote of them to Paris. At the same time he withdrew to Cadiz, leaving his light vessels off the place to blockade it. This light squadron was captured by Leake, who had hastened from Lisbon on news of its appearance; then the

[199] Colomb. *Naval Warfare.*

[200] A naval force compelled by circumstances to take station off a port which it cannot use as a base is, *a priori*, in a delicate position; it is never complete, on account of the need to revictual its ships and to maintain distant lookout vessels. The position taken by the English squadron had the curious result of making the attack defend itself and the defense attack.

English fleet, after having supplied the rock, returned to its post of observation.

The blindness of the French government having forced Pointis to lend more effective co-operation to the troops, the latter invested Gibraltar by sea and was surprised by Leake, who arrived from Lisbon for the third time. Eight of his ships were then off to leeward; the five that remained with him were captured.

This result might have been foreseen. We may well ask through what blindness the Versailles Cabinet assumed to undertake an operation of long duration in the presence of a naval force specially intended to oppose it. If the English squadron could have been destroyed, the besieged would perhaps have surrendered, because, seeing no longer any possibility of being aided, they would have judged it useless to prolong a hopeless struggle; but the assurance that the fleet would appear gave them strength to resist until all means of resistance were exhausted.

And, since we are speaking of Gibraltar, let us observe that the English have never believed, either on that occasion or on any other, that a bombardment could reduce the place, because they knew that the batteries would defend themselves and would end by having the best of it. These expectations have been realized.

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DUELING IN THE OLD NAVY.

By CHARLES OSCAR PAULLIN.

The following paper consists of two parts: (1) a few general observations upon the subject of naval dueling; and (2) a list of eighty-two naval duels, giving all the important facts respecting them that were obtainable.

For many years the officers of our navy recognized the binding force of the duello in the settlement of their personal grievances. In this they were in no way singular, for, a few decades ago, gentlemen of every class, with the exception of ministers, were wont to bring their enemies to account on the field of honor. How respectable was this method of adjudicating differences may be seen from the names of some of the leading American statesmen who fought duels: Alexander Hamilton, Aaron Burr, John Randolph of Roanoke, Henry Clay, Andrew Jackson, and Thomas H. Benton. *Claypoole's Daily Advertiser* for June 12, 1800, states that twenty-one duels had been recently fought in the United States within six weeks, resulting in the death of six men and the wounding of eleven.

Both in and out of the navy the opinion was common that dueling was an especially appropriate method of redressing grievances for army and navy officers. Commodore Stephen Decatur held that a man who made arms his profession was not at liberty to decline an invitation from any person socially and professionally his equal. President Andrew Jackson is quoted as saying, in 1830, when he had decided to stop all duels between officers and civilians, that he would not interfere in duels between officers, since their profession was fighting and they were trained to arms.[1]

[1] Sabine, *Duels and Duelling*, 150; Sands, *From Reefer to Rear-Admiral*, 40.

While the officers of the Old Navy would have freely subscribed to the sentiment of Shakespeare, "Life every man holds dear, but the dear man holds Honor far more precious-dear than life"; nevertheless those who had reached a mature age were exceedingly averse to giving or receiving a call to arms. Only three captains of the Old Navy, O. H. Perry, Stephen Decatur and James Barron; and two captains of marines, James McKnight and John Heath, engaged in dueling. The older officers fought more from fear of losing social and professional standing than from choice. Even after a challenge had been given and accepted, they were usually inclined to listen to the sober advice of friends and the earnest pleadings of wife and children. Thus in 1807 a duel between Commodores John Rodgers and James Barron was averted. In 1840 a quarrel between Lieutenant David D. Porter (afterwards Admiral), and Lieutenant Stephen C. Rowan (afterwards Vice-Admiral), was peacefuly settled by their seconds. Commodore M. C. Perry, famous for his expedition to Japan, once adjusted a private difficulty without a resort to battle. Regarding the settlement of disputes between officers, Rear-Admiral Daniel Ammen, who entered the navy in 1836, wrote as follows:

"In the twenty-one years that I have passed on board of vessels, although challenges have frequently occurred, no duel has resulted, from a reasonable consideration of the difficulty by the seconds . . . . I have never received a challenge, nor have I ever thought it necessary to send one. I have, nevertheless, been a second several times, with the happy result of composing the difficulties without the actual use of pistols or other weapons."[2]

But a single officer of the grade of master commandant, Charles Gordon, fought a duel; and he fought two, both of which had their origin in disputes over the *Chesapeake-Leopard* affair. From 1798 to 1820 the lieutenants were somewhat sensitive respecting points of honor, but after that date they generally compounded their differences. Now and then some staff officer, perchance a surgeon or purser, accepted a challenge. The midshipmen, however, were the chief duelists of the Old Navy. These hot-headed youngsters were wont to fight each other on the slightest provocation. Of the eighty-two duels of which I have obtained a more or less definite account, midshipmen par-

[2] Ammen, *The Old Navy and The New*, 44.

ticipated in fifty-two. Usually a midshipman was matched against a midshipman, but infrequently some bellicose youth found a lieutenant who would waive his rank and give him battle, or perhaps he succeeded in calling out a staff officer or civilian. The middies, not having much rank, were wonderfully jealous of what little they had, and woe betide the careless shipmate who cast a shadow of offense upon it. Crowded together in the narrow quarters allotted to them on shipboard, they found ample opportunity for quarreling. For what trivial reasons they fought each other a few examples will show: Midshipman Redick offends Midshipman Barrymore by entering the messroom with his hat on his head; Midshipman Kerr applies the opprobrious epithets of "boot-lick" and "curry-favorer" to Midshipman Barney; one midshipman objects to the opening of a scuttle by another; one midshipman persists in sprinkling a letter which another is writing until finally the latter empties the contents of an ink bottle upon the new vest of the offender; Midshipman Gale tells the sweetheart of Midshipman Dallas that her lover is intemperate and unpopular with his fellow-officers. For such causes as these did the naval youngsters bleed and die.

During the first fifty years of the Old Navy, 1798-1848, the mortality of naval officers resulting from duels was two-thirds that resulting from naval wars. Thirty-six men were killed in the eighty-two duels that I have listed. Of these, thirty-three were naval officers, and three civilians. It has been estimated that one-fifth, or twenty per cent, of those who engaged in duels, are killed. The figures above give a mortality of twenty-two per cent. This is five times the mortality of the federal army during the Civil War. One-half of those not killed in naval duels were wounded. The relatively large number of casualties is not surprising when we recall that the customary distance between the duelists was only ten paces, or thirty feet. A moderately skillful marksman could readily hit his adversary at that distance, with a pistol, the usual weapon, provided he was not unduly nervous. In a few duels the distance was even less than thirty feet. It was twenty-four feet in the Barron-Decatur duel, and half that in the Bainbridge-Cochran duel. Midshipman Mercer stood so near his antagonist that their pistols almost touched; both fell dead at the first fire. Two midshipmen in the Mediterranean fought at a distance of fifteen feet, under an engagement that should they

miss at the first fire, they would advance and place their pistols breast to breast. At the first fire the pistol of only one of the combatants went off; its ball crippled for life the other combatant.

Dueling in our navy was at its height during the years 1799-1836. Indeed, with the older officers, it began to decline after 1820, the year of the Barron-Decatur duel. Among the officers of the Continental navy, there was but one hostile meeting, as far as I have been able to discover, that between Captains Pierre Landais and Denis Nicolas Cottineau, fought about 1779. Both were Frenchmen, and were commanders of vessels under John Paul Jones at the battle of Flamborough Head. During that celebrated engagement, Landais was guilty of insubordination, and was later accused by Jones of purposely firing into the flagship of the American fleet, the *Bon Homme Richard*. The conduct of the recalcitrant captain resulted in a mortal quarrel between him and Jones. Their differences were investigated by Benjamin Franklin, the American minister to France. The testimony of Cottineau at the investigation led to his being challenged by Landais. The duel was fought in Holland, with small swords, and, as Landais was a master of that weapon, he succeeded in severely wounding his antagonist.[3] The latest duel of which I have definite record was fought in 1849. It is certain that challenges were sent, and in all probability a few duels took place after that date. At least two duels occurred in the Confederate navy during the Civil War. One of these was fought at New Orleans by Master Lewis Musgrave and Mr. Richard Weightman; the other at Richmond by Midshipman Joseph Gardner and Mr. E. A. Pollard.[4]

Most of the naval duels in the United States were fought either near Bladensburg, Maryland, or in the vicinity of New York, or in the vicinity of Norfolk. Commodore Stephen Decatur and Midshipman Daniel M. Key were killed at the famous Bladensburg dueling grounds. A lieutenant and two midshipmen lost their lives near New York, and several midshipmen were mortally wounded in duels near Norfolk. Fatal duels were fought on Castle Island, Boston harbor, at New Orleans, and near

[3] Sabine, *Duels and Duelling*, 226-227. I have not been able to find a contemporary account of this duel.

[4] This information was obtained from Captain H. B. Littlepage, Washington, D. C.

Chester, Pennsylvania. Commodore O. H. Perry and Captain John Heath, of the marines, had a meeting at or near Weehawken, the scene of the Hamilton-Burr duel. Abroad, Gibraltar, Port Mahon, Rio Janeiro, and Valparaiso were the favorite places of our naval officers for settling their quarrels. In the East Indies they seemed to find the Dutch possessions the most convenient. The younger officers of the Mediterranean squadron were especially prone to seek redress on the field of honor, and some eight or nine of them fell victims to their observance of the duello.

In most naval duels both principals were officers of the navy. Now and then, however, one of them was a civilian or a British officer. In three cases our officers fought with masters or mates of merchantmen. In one of the most notorious duels of the Old Navy a midshipman met and killed on the field a young lawyer of Philadelphia. In 1822 a clerk of the Treasury Department in Washington wounded a midshipman and escaped injury himself. Eight duels were fought with Englishmen; of these, four were with army officers at Gibraltar; one, with a naval officer at Genoa; one, with the Secretary of the Governor of Malta, at Malta; and two, with English officers serving in the Chilian Navy, at Valparaiso. The duels at Gibraltar resulted from quarrels between the officers of our squadron and the officers of the British garrison at that place. Several conferences respecting them were held by our minister in London and Lords Castlereagh and Bathurst.[1]

The officers of the navy took many measures to restrict or prevent dueling. In 1807 six lieutenants, led by James Lawrence and O. H. Perry, proposed the organization of a "Court of Honor" for the purpose of establishing harmony and preserving unsullied the honor and reputation of the officers of the navy. One regulation provided that in all disputes between officers the person aggrieved must lay the circumstances before the court for its investigation and decision. In 1809 Commodore Decatur required the midshipmen under his command to pledge themselves that they would neither give nor accept a challenge without first referring their disputes to him. For many years Decatur's plan for restraining the young gentlemen of the fleet was very popular with naval commanders. In 1824 Captain John Orde Creighton

[1] Sabine, *Duels and Duelling*, 11.

recommended to the Secretary of the Navy that all officers on entering the service should be required to pledge themselves not to be concerned in a duel. Vigorous means were often used by the older officers to prevent their midshipmen from fighting. In 1841 Commodore M. C. Perry, the commandant of the New York navy yard, on learning that Midshipman W. F. Dejongh was in the city for the purpose of fighting Midshipman Walter Shields, ordered Dejongh to the navy yard and threatened him with imprisonment on board the *North Carolina* unless he pledged himself not to meet his adversary secretly. As Shields was at Philadelphia, Perry apprized the commandant of the navy yard in that city in order that he might put the young man under restraint.

From 1830 to 1850 the President, and the Secretary of the Navy now and then tried to discourage or suppress dueling. In 1830 President Jackson, on the recommendation of Secretary of the Navy John Branch, dismissed four officers for being concerned in a duel. He reinstated the offenders, however, after the public feeling against them subsided. Occasionally the Secretary of the Navy requested the resignation of some young duelist, whose record was otherwise bad. In April-May, 1845, Dr. Thomas Henderson, a surgeon of the army, published in the *National Intelligencer*, a series of letters, addressed to Secretary of the Navy George Bancroft, entitled "Duels and Duelling in the Naval Service of the United States." Their purpose was to discourage dueling in the navy and to call public attention to the need of a naval academy. In July, 1845, Bancroft convened in Washington a board of nine naval officers, of which Commodore John Downes was president, to deliberate upon the best mode of extirpating the barbarous practice of dueling from the navy, and to consider the expediency of issuing a general order forbidding dueling by naval officers, and of instructing commanders to report to the department the aggressors in duels. The board reported in favor of the issuing of an order prohibiting dueling, and providing for the punishment by dismissal from the navy of the aggressor and also of any officer who should waive his rank in order to meet an inferior officer.[6] The Secretary of the Navy seems not to have acted upon this report. In 1848 two duels were fought by midshipmen of the naval academy, and the offi-

[6] Captain's Letters (MS. Navy Department Archives), July-August, 1845, No. 26.

cers participating in them were dismissed from the service by President Polk. Later, however, all but one of them were reinstated. In 1849 or 1850, President Taylor refused to restore two officers who had been dismissed from the navy for offenses committed under the duello. He said to his cabinet that he had served in the army for forty years without fighting, that duels were unnecessary, and that "he would have no dueling men about him if he could help it."[1] In 1857 a list of naval regulations was prepared by a board of naval officers in which dueling was made punishable by dismissal from the navy or by such penalty as a court-martial might inflict. The naval regulations of 1865 contained this provision on the subject of dueling: "No person in the navy will upbraid another person in the navy for refusing a challenge to fight a duel. Every person is enjoined to assist in the honorable adjustment of any differences that may occur. No disgrace can attach to any one for refusing a challenge, as such a course would be in obedience to law."

In 1802, 1820, 1824, and 1843 attempts were made in Congress to prevent dueling in the navy. In 1806 a law was passed prohibiting dueling in the army, but it was frequently violated by the officers of that service. After Congress had several times refused to stop dueling in the District of Columbia, it finally, in 1839, moved to action by the death of Congressman Jonathan Cilley in a duel with Congressman William J. Graves, forbade the giving or the accepting of a challenge in the district. Not until July 17, 1862, was dueling in the navy a violation of law. The act for the better government of the navy passed on that date made the sending or accepting of a challenge, or the acting as a second, punishable by such penalty as a court-martial might adjudge.

The decline of dueling in the navy resulted more from the growth of a sentiment against this barbarous practice than from any formal regulation by the department or enactment by Congress. Naval officers, in common with other members of society, responded to the higher ethical teachings that spread throughout Christendom during the first half of the nineteenth century. An old standard respecting the settlement of personal grievances was gradually displaced by a new one. The dismissal of midshipmen by the President may have had a slightly deterrent effect

[1] Sabine, *Duels and Duelling*, 40.

upon those quarrelsome young gentlemen; and the establishment of the naval academy doubtless checked dueling to some extent by bringing into the navy a better class of young men.

LIST OF DUELS.

In the list of duels that follows, I have, wherever possible, given the place and date of occurrence, the names of the principals and seconds, the cause, the result, and other important details. When the date of the duel can be given only approximately it is placed in parenthesis. Those duels which resulted fatally are indicated by an asterisk. The number of duels here listed is eighty-two. I have found mere references to several others, which would bring the number to about ninety. If to these we add those concerning which I have no information, the total number would exceed one hundred.

1. 1799. Lieutenant Stephen Decatur and ————.

This duel occurred while Decatur was a young officer attached to the U. S. frigate *United States*. He was at Philadelphia enlisting seamen for his vessel when several of his recruits shipped on board an East Indiaman. He visited the merchant vessel and obtained the release of his men, but not without receiving a tongue-lashing from her high-spirited chief mate. Advised by his father, Captain Stephen Decatur, Sr., the young lieutenant decided to call the chief mate to account, which he did by demanding an apology. It was refused, and a challenge was sent and accepted. Decatur, before repairing to the dueling-ground said to his friend, Lieutenant Charles Stewart, that, as his antagonist was doubtless inexpert in the use of arms, he would not kill him but would shoot him in the hip. He chose Lieutenant Richard Somers as his second. In the duel he wounded the chief mate in the hip, as he said he would do, but escaped injury himself.[8]

2. *(1799). Midshipman Samuel W. Cushing and ————. In this duel Cushing was killed.[9]

3. 1800. Lieutenant ———— and ————.

The following note gives an account of this duel: "Norfolk, March 4. On Friday morning last, a duel was fought at the Sycamores, near this borough by a capt. T., master of a brig

[8] Mackenzie, *Stephen Decatur*, 37-39.

[9] Register of the Navy, A (MS., Navy Department Archives).

now in the harbor, and lieutenant S., of the U. S. frigate *Congress*, in which the former was shot through the body. We are happy to find that the wound has not proved mortal, and there are favorable symptoms of a speedy recovery."[10]

4. *1800. Lieutenant Philip Edwards and Lieutenant John L. Lewis (of the marine corps).

This duel occurred on October 16, 1800. Edwards was killed.[11]

5. (1800). Lieutenant Richard Somers and ————.

6. (1800). Lieutenant Richard Somers and ————.

7. (1800). Lieutenant Richard Somers and ————.

These duels originated in the following trivial cause. Somers and Lieutenant Stephen Decatur were warm friends and were in the habit of speaking freely of each other. On one occasion Decatur, in perfect good humor, called Somers a "fool," in the presence of some five or six officers. Somers thought nothing of the remark until several of the officers who heard it refused to drink wine with him. He asked them for an explanation and they frankly told him the cause of their refusal, his failure to resent Decatur's insult. He sought Decatur and related to him the circumstances, and Decatur at once proposed a peaceable plan for clearing up the misunderstanding of the officers. Somers would not listen to it, but immediately challenged each of the five or six officers to fight him at different hours of the same day, declaring that only in this way could he convince them of his courage. All the challenges were accepted. In the first duel Somers was wounded in the right arm, and in the second in the thigh. He became so weak from loss of blood that he had to fight the third duel in a sitting posture, supported by his second, Lieutenant Decatur, who offered in vain to take his place and continue the fighting. Thus sustained, Somers fired and wounded his antagonist. As the officers were now thoroughly convinced of his courage, the two or three remaining duels were dispensed with.[12]

8. *(1801). Midshipman Thomas Swartout, Jr., and Midshipman J. S. Higinbotham.

Swartout was ordered to the U. S. S. *Essex* on April 19, 1801, which vessel was then about to sail for the Mediterranean. He

[10] *Claypoole's American Advertiser*, March 14, 1800.
[11] Register of the Navy, A.
[12] Goldsborough, *Naval Chronicle*, 237-238.

was killed at Algeciras, Spain, in a duel, by Midshipman Higinbotham, of the same ship, in 1801 or 1802.[12]

9. *1802. Captain James McKnight (of the marine corps) and Lieutenant R. H. L. Lawson.

McKnight and Lawson were officers of the U. S. S. *Chesapeake,* which vessel was attached in 1802 to the Mediterranean squadron. The hostile meeting took place at Leghorn, on October 14, 1802. McKnight was killed. His wife was a sister of Captain Stephen Decatur.[14]

10. *1803. Lieutenant Henry Vandyke and First Lieutenant W. S. Osborn (of the marine corps).

The following account of this duel is taken from a letter of an officer of the U. S. S. *New York,* dated Gibraltar, March 26, 1803:

"While lying in Malta, Lieutenant Van Dyke, and the 1st lieutenant of marines, Mr. Osborne, went on shore to settle a trifling dispute. After exchanging four shots, Lieutenant Van Dyke received a ball in his right thigh, which passed through and was extracted from his left, which terminated his existence after an illness of three weeks."[15]

11. *1803. Midshipman Joseph Bainbridge and Mr. —— Cochran.

Bainbridge was a young midshipman on board the U. S. S. *New York,* one of the vessels of the Mediterranean squadron. At Malta he and a messmate attended a theatre, and were seated near a party composed of Cochran, who was the secretary of Sir Alexander Ball (the governor of the island), and several British officers. The members of the party spoke sneeringly of the young Americans and their countrymen, saying in allusion to the war we were then waging with Tripoli, "Those Yankees will never stand the smell of powder!" Soon after this remark was made Bainbridge and his companion retired to the lobby of the theatre to consider what notice they should take of it. They were followed by the Englishmen, one of whom, Cochran, ran rudely against Bainbridge, and twice repeated the offense. The third time Bainbridge knocked him down, and on the following morning he received a challenge from Cochran, which he ac-

[12] Register of the Navy, A; Ships' Service Book (MS. Navy Department Library).

[14] Sabine, *Duels and Duelling,* 243; Miscellaneous Letters (MS., Navy Department Archives), III, No. 48.

[15] *Federal Gazette and Baltimore Daily Advertiser,* May 13, 1803.

cepted, choosing Lieutenant Stephen Decatur as his second. Since Bainbridge was a mere youth, unskilled in dueling, while Cochran was a sure shot at ten paces, the usual distance, Decatur insisted that the duel should be fought at four paces. On learning Decatur's terms, Cochran's second said to him, "This looks like murder, sir." "No, sir," replied Decatur, "this looks like death." At the first fire neither principal was injured; at the second fire the Englishman fell, mortally wounded below the eye; while the young midshipman stood unhurt. Joseph Bainbridge was a brother of Commodore William Bainbridge. Samuel Taylor Coleridge, the poet, succeeded Cochran in the office of secretary to the governor of Malta.[10]

12. *1804. Midshipman William R. Nicholson and Midshipman Frederick C. De Krafft.

These young men were officers of the U. S. S. *Siren,* which vessel in 1804 was attached to the Mediterranean squadron. They fought a duel at Syracuse. Its cause is not known, although there is a tradition that a young Syracusan woman had something to do with it. The grave of Nicholson near Syracuse may still be seen. Its tablet bears the following inscription: "In memory of William R. Nicholson, a midshipman in the navy of the United States, who was cut off from society in the bloom of his youth and health, on the 18th day of September, A. D., 1804, aged eighteen years." De Krafft, for his offense, was sent home in the U. S. S. *Scourge,* under arrest.[11]

13. 1807. Midshipman David Redick and Midshipman Joseph H. Barrymore.

These young men were attached to the flotilla at New York. They were messmates, and one one occasion Redick entered the messroom with his hat on his head. Barrymore directed him to take off his hat, telling him that his deportment was ungentlemanly. To this speech the offending youth observed, "Barrymore, you have often taken improper liberties with me, and I therefore wish to have nothing further to do with you." Barrymore insisted that these words be explained, but Redick refused to explain them. Here for a time the dispute rested. Redick, however, on finding that he was condemned by some of

[10] Mackenzie, *Stephen Decatur,* 55-58; Sabine, *Duels and Duelling,* 126; *Federal Gazette and Baltimore Daily Advertiser,* May 13, 1803.

[11] *The Washington Post,* May 2, 1883; Register of the Navy, C, 207.

his fellow-midshipmen for submitting to the affront offered him, challenged Barrymore, who accepted the challenge. The duel was fought in an orchard, about a mile from the Brooklyn navy yard, on August 20, 1807. The seconds were Midshipman Walter Boyd and John R. Laycroft. Barrymore was severely wounded in the hip. Redick was uninjured.[18]

14. 1807. Midshipman James M. Broome and Midshipman Richard Crump.

15. 1807. Master Commandant Charles Gordon and Dr. ——— Stark.

16. 1807. Master Commandant Charles Gordon and Mr. A. J. M'Connico.

These duels, which took place in the early fall of 1807, grew out of disputes over the fight between the *Chesapeake* and *Leopard*. Broome, Crump, and Gordon were officers of the ill-fated *Chesapeake,* and Stark and M'Connico were citizens of Norfolk, and relatives or friends of the captain of the *Chesapeake,* James Barron. In the Broome-Crump duel, Broome received a flesh wound in the thigh. The Gordon-Stark duel arose from certain remarks made by Stark reflecting on Gordon's conduct during the fight. In the preliminary arrangements, it was stipulated that should one of the principals fire too soon, the second of the other might shoot him. After six shots had been exchanged, the word for the seventh was given. Stark fired prematurely, so Lieutenant W. H. Crane, the second of Gordon claimed, who, in accordance with the stipulation, shot at the doctor, wounding him in the arm. Stark's second, A. J. M'Connico, denied that his principal had fired improperly. This contention was duly settled by Gordon and M'Connico. Both were wounded, but not dangerously.[19]

17. *1807. Lieutenant Benjamin Turner and Sailing Master John Rush.

These two officers were in command of gunboats at New Orleans. They fought a duel on October 1, 1807, which resulted in the death of Turner. Their superior officer, Lieutenant James Leonard, referred to this duel as an "unavoidable occurrence."[20]

[18] John Rodgers Papers (MS., Navy Department Library), Rodgers to the Secretary of the Navy, Sept. 1, 1807.

[19] *New York Evening Post,* Oct. 3, 1807; Captains' Letters, Decatur to Secretary of the Navy, Oct. 21, Nov. 1, Nov. 19, 1807.

[20] Officers' Letters (MS., Navy Department Archives), 1807, III, No. 88.

18. *1808. Midshipman Eli E. Danielson and Midshipman P. P. Schuyler.

These two midshipmen were attached to the gunboat flotilla at New York. They had a dispute over some trivial matter, in which Danielson seems to have been the aggressor. Having repaired to the dueling-grounds chiefly from motives of bravado, they were ashamed to return to the flotilla without fighting. The seconds were Midshipmen Walter Boyd and Edward A. Evans; the former, according to Commodore John Rodgers, was "perfectly destitute of the principles of a gentleman." Danielson, who was a stepson of General William Eaton, was shot through the heart and expired almost instantly. The meeting occurred on the afternoon of August 5, 1808, near New York. The surviving members of the party absconded into New Jersey. In 1809 Schuyler was dismissed from the navy.[21]

19. *1809. Midshipman James Voorhees and Surgeon's Mate Hyde Ray.

Voorhees and Ray were officers of the frigate *Essex*, Master Commandant John Smith. Voorhees is said to have insulted Ray and then challenged him. The duel, which was fought near Norfolk, on October 19, 1809, resulted in the death of Voorhees.[22]

20. 1809. Midshipman R. B. Mitchell and Midshipman Green Lynch.

This duel, which had its origin in some trivial cause, was fought early in December, 1809, near Norfolk. Lynch was wounded in the breast. Captain Stephen Decatur reported that, while the two officers were "censurable," their conduct was "honorable throughout." To discourage dueling he required all the youths under his command to pledge themselves that they would neither give nor accept a challenge without first referring their disputes to him.[23]

21. *1810. Midshipman Richard Rodgers and Midshipman Charles W. Morgan.

Rodgers and Morgan were midshipmen on board the U S. frigate *Constitution*, Captain Isaac Hull. The cause of their duel is not known, but it is said to have been such as left, under the code of honor of that time, no recourse but a hostile meeting.

[21] Captains' Letters, 1807, III, No. 55.
[22] Master's Letters (MS., Navy Department Archives), 1809, II, No. 91.
[23] Captains' Letters, 1809, IV, No. 77.

Morgan's second was Surgeon's Mate Samuel Gilliland; and Rodgers', Midshipman Archibald Hamilton, the son of Secretary of the Navy Paul Hamilton. Both seconds were officers of the *Constitution*. The dueling party obtained permission to go ashore on the afternoon of October 16, 1810, at Sandy Hook, New York, "for the purpose of shooting." After reaching the grounds Gilliland and Hamilton did everything in their power to prevent the duel, and finding their efforts fruitless, they conducted it in "the most fair and honorable manner." Rodgers was killed almost instantly, and Morgan was wounded in the breast. On learning of the duel Hull placed Morgan under arrest and suspended from duty the two seconds. Under orders from the Secretary of the Navy he later released the surviving principal, and restored the two seconds to duty. Rodgers was buried at Sandy Hook. Morgan became a distinguished officer of the Old Navy, dying in 1853 as a post-captain.[24]

22. *1811. Midshipman Joseph Brailsford and Midshipman Charles M. Fowle.

These young men were attached to the U. S. frigate *Constitution,* Captain Isaac Hull, which vessel was stationed at New London, Connecticut, during the winter of 1810-1811. They fought a duel about fifteen miles from New London on the afternoon of February 19, 1811. Their seconds were Midshipmen William Loughton and John Packet, also officers of the *Constitution.* Fowle was wounded in the thigh, and died on March 15. The Secretary of the Navy expressed his displeasure by ordering Brailsford and Packet transferred to another ship.[25]

23. *1811. Midshipman Landon Mercer and Mr. ——— Roberts.

Mercer was a midshipman on board the U. S. frigate *United States,* Captain Stephen Decatur. Having received an insult from Roberts, he challenged him. A hostile meeting occurred about sundown of December 22, 1811, within a mile of Norfolk. Mercer was accompanied by Midshipmen Foxhall A. Parker and John H. Bell and Surgeon's Mate William M. Clarke. The distance apart of the two principals was just sufficient to prevent their pistols from touching. On the giving of the word, both

[24] *Ibid.*, 1810, III, Nos. 76, 77, 81; John Rodgers' Papers, Rodgers to Hull Oct. 17, 1810; Hull to Rodgers, Oct. 27, 1810.

[25] Captains' Letters, 1811, I, Nos. 94, 126, 134.

fired; and both fell dead. Soon, all Norfolk was in an uproar. The surviving members of the dueling party sought safety in flight, leaving their dead comrades without a soul near them. The two bodies were brought to Norfolk on the evening of the 25th, and were interred on the next day. On the 27th Decatur reported that the three surviving officers had not yet returned to the ship, and that they were being sought for by the civil authorities.[26]

24. 1813. Acting Master ——— Brownell and Purser Humphrey Magrath.

25. *1813. Acting Master ——— Macdonald and Midshipman George Senat.

These two duels, and several others, originated in the dispute between Captains O. H. Perry and Jesse D. Elliott over their respective merits and credits due them for the American victory at the battle of Lake Erie, on September 15, 1813. They took place soon after the battle, probably on the shore of the lake. "Purser Magrath, who certainly could not be called a non-combatant," A. S. Mackenzie wrote, "led the way in the first duel with Acting-Master Brownell; others followed in almost uninterrupted succession; and eventually, not long after Captain Elliott's removal, young Senat, who commanded the *Porcupine* during the action, lost his life in a duel with Acting-Master Macdonald."[27]

26. (1816). Lieutenant Joseph L. Kuhns (of the marine corps) and ———.

Niles' Register reports that Kuhns was killed in a duel with some foreign officer. The statement that Kuhns was killed is erroneous.[28]

27. *1817. Midshipman Seth Wheaton and ———.

Midshipman Wheaton was killed in a duel fought early in February, 1817, probably at Gibraltar.[29]

28. *1817. Lieutenant Richard S. Heath and Midshipman John L. Hopkins.

Heath was attached to the U. S. S. *Saranac* and Hopkins, to the U. S. S. *Enterprise*, both of which ships were stationed at

[26] *Niles' Register*, I, 335; Captains' Letters, 1811, II, 232.
[27] Mackenzie, II, *O. H. Perry*, 48.
[28] *Niles' Register*, XI, 296.
[29] Captains' Letters, 1817, I, No. 48.

New York. Hopkins was the aggressor. He drew a cartoon in which a figure labeled "Horatio" was pulling the nose of a figure labeled "Richard," and dropped it on shipboard where Heath's attention would be called to it. A little later a second cartoon, in which Heath's likeness was portrayed, was found by Heath himself, who soon let it be known that he had no objection to giving the author of the cartoons "gentlemanly satisfaction." Hopkins, who showed a great desire to call out his senior in rank, at once declared that he was their author. His last note to Heath which throws some light on his character, read as follows: "You consider it ungentlemanly, and are willing to wave rank with the author of the caricatures. I shall expect you to preserve your veracity, and meet me. My friend, Mr. Hobbs, will attend to furthering the affair."

The meeting, which took place in New Jersey, near New York, on the afternoon of June 2, 1817, resulted in the death of Heath. Midshipman H. H. Hobbs represented Hopkins; and Lieutenant John H. Lee, Heath. The surviviors of the dueling party absented themselves for several days from their ships.[28]

29. 1817. Lieutenant R. F. Stockton and ———.

The origin of this duel was as follows: Some American officers during a visit to Naples, pleased with the faithfulness of a Neapolitan boatman gave him a recommendation in writing, addressed to all Americans who should visit the city. When a little later the British ship of war *Albion*, Admiral Penrose, arrived at Naples, the boatman taking her for an American vessel, presented his paper to her officers, and they handed it back to him after one of them had written these words on it: "That, notwithstanding the recommendation of the Americans, the boatman was an extravagant knave; but it was supposed he charged the American officers less on account of their parsimony and the known poverty and meanness of the American government." On the arrival of the U. S. S. *Erie* at Naples in the summer of 1817, the boatman presented his paper to the First Lieutenant of the *Erie*, R. F. Stockton, who, on reading it and finding that an officer of the *Albion* had written the endorsement, put the paper in his pocket. As soon as the *Erie* was moored he sent one of his officers to the *Albion* to demand the name of the author of the endorsement. At first all the officers denied having any

[28] Captains' Letters, 1817, III, Nos. 5-7.

knowledge of the matter, but finally, after Stockton had declared that he would hold all of them responsible, one of them acknowledged that he had written the endorsement. Stockton immediately sent him a challenge. The Englishman offered to make a verbal apology, but Stockton refused to accept it, insisting that as the insult was in writing the apology must be in writing also. The Englishman declined to make the additional concession, and a duel took place. At the second fire the Englishman was slightly hurt in the leg, and refused to proceed farther. Stockton insisted that he should either continue the contest or else apologize in writing, but the Englishman declared that he would do neither. The plucky and pertinacious lieutenant then called him a coward and said that he should take the liberty of caning him whenever he should chance to meet him; and thus the affair ended.[31]

30. (1817). Lieutenant R. F. Stockton and Midshipman ———.

This duel occurred while Stockton was the First Lieutenant of the U. S. *Erie*, while that vessel was in the Mediterranean. Overhearing a remark of one of his midshipmen, which he considered offensive, he took notice of it; and the midshipman challenged him. It was agreed that the duel should be fought at eight paces. On the giving of the word the midshipman fired promptly, before Stockton was ready to fire, and missed him. Stockton urged that the midshipman should reload again, while the midshipman contended that Stockton should first take the fire that was due him. Stockton then discharged his pistol in the air, but the midshipman refused to accept this as sufficient. Finally the chivalrous principals declared themselves satisfied, and the duel was discontinued.[32]

31. *1818. Midshipman John R. Keasby and Midshipman William F. Thorniley.

These young men were attached to the U. S. S. *John Adams*, Captain J. D. Henley, which vessel in 1818 was stationed near Amelia Island, off the coast of Florida. The seconds, Midshipmen John A. Cook and Alexander Hossack, were also officers of the *John Adams*. The duel was fought on February 28, 1818,

[31] Life of R. F. Stockton, 32; *Niles' Register*, XXVII, 179. The accounts of the duel found in these two books are written from the American point of view.

[32] Life of R. F. Stockton, 30-31.

at a distance of six paces. Both principals were mortally wounded, and died about twenty-four hours later. They were buried at St. Marys. "I cannot sufficiently express my detestation of this horrid practice which has ever been reprobated by me," wrote Captain Henley to the Secretary of the Navy in giving an account of the melancholy event.[32]

32. 1818. Commodore O. H. Perry and Captain John Heath (of the marine corps).

In 1816 Perry was the commander and Heath the captain of marines of the U. S. frigate *Java*, one of the vessels of the Mediterranean squadron. Heath, who appears to have been a good-natured, careless, indolent officer, was much disliked by his captain. On one occasion two marines jumped overboard, and Perry took instant measures to recover them. He ordered Heath to come on deck, but the captain of marines sent word that he was indisposed. Perry repeated his orders. Finally Heath appeared and mustered his men, but he did his work in a careless manner and failed to report it to his commander until told to do so. Greatly irritated, Perry ordered Heath to go below, saying that "he should do no more duty on board the *Java*." Deprived of his office, Heath wrote to Perry asking him why he had been thus treated. Perry sent for him, and during an interview struck him with his fist. "Passion became predominant," Perry afterwards said, "and I gave him a blow."

After consulting with his officers respecting the unfortunate occurrence, Perry expressed a readiness "to make an honorable and personal apology such as would be proper for Captain Heath to receive and Captain Perry to make." Advised by his brother marine officers, Heath refused to accept the apology. Perry now submitted a statement of the affair to Commodore Isaac Chauncey, the commander-in-chief of the squadron, and asked for a court-martial. On December 30, 1816, Chauncey convened a court at Port Mahon to try both officers. Both were found guilty and both were sentenced to be privately reprimanded by the commander-in-chief—certainly a lenient punishment for Perry.

On the return of the squadron to the United States, the friends of Heath and the public prints fanned the flames of the smouldering quarrel. In course of time Heath challenged his adversary, who in accepting the challenge caused the following provision to be endorsed on the back of the agreement regulating the terms

[32] Captains' Letters, 1818, I, No. 94.

of the meeting: "Captain Perry desires it to be explicitly understood that, in according to Captain Heath the personal satisfaction he has demanded, he is influenced entirely by a sense of what he considers due from him, as an atonement to the violated rules of the service, and not by any consideration of the claims which Captain Heath may have for making such a demand, which he totally denies, as such claims have been forfeited by the measures of a public character which Captain Heath has adopted towards him. If, therefore, the civil authority shall produce an impossibility of meeting at the time and place designated, which he will take every precaution to prevent, he will consider himself absolutely exonerated from any responsibility to Captain Heath touching their present cause of difference." According to Perry's view, he was not accountable to Heath, but, since he had raised his hand against a person honored with a commission of the government, it was incumbent upon him to atone for his violation of the rules of the service by granting Heath a meeting. However, he felt that he was under no obligation to return the fire of his adversary; and he declared that he would not do so.

Perry chose Commodore Stephen Decatur to act as his second; and Heath chose First Lieutenant Robert M. Desha. October 8, 1818, was the day, and the neighborhood of Washington, the place first agreed upon. While the parties were on their way to the capital, they learned that Decatur had departed thence to New York. They therefore retraced their steps, and finally met on October 19 on the New Jersey shore of the Hudson, above Hoboken, the scene of the duel between Hamilton and Burr and many other distressing tragedies. Perry's biographer writes of this meeting as follows:

"The seconds stood aside; the splendid figure of Decatur erected to its fullest statue, and his noble countenance more than usually calm and thoughtful. At the word, the antagonists advanced five paces with a measured step, regulated by the voice of one of the seconds, then wheeled, Heath discharging his pistol towards Perry, and Perry abstaining from firing. Decatur now stepped forward and declared that Commodore Perry had come to the ground with the fixed determination to receive without returning the fire of Captain Heath, in evidence of which he read the letter which months before had been addressed to him. Decatur then observed that he presumed that the party claiming to be aggrieved was satisfied. Captain Heath asquiesced, through his friend, in this opinion, and admitted that his injury was atoned for." [24]

[24] Mackenzie, *O. H. Perry*, II, 128-136, 139, 152-157, 180-183; Sabine, *Duels and Duelling*, 214.

33. *1819. Midshipman J. B. Abercrombie and Midshipman Alexander G. Gordon.

Abercrombie and Gordon were attached to the U. S. S. *Macedonian,* Captain John Downes. On March 2, 1819, they fought a duel at Valparaiso, Chile. Abercrombie fell and expired immediately.[35]

34. *1819. Lieutenant William B. Finch and Lieutenant Francis B. White (of the marine corps).

White was the aggressor in this duel. His grievance against Finch arose in 1815 when they were fellow-officers aboard the U. S. S. *Independence.* In the correspondence that preceded the duel he made four charges against Finch: (1) undertaking to reprimand me on the quarter-deck in the presence of the crew, (2) flogging two marines without my knowledge or consent, (3) general ungentlemanlike deportment towards me, and (4) saying to Lieutenant Legge that I was ignorant of my duty. In a letter accepting White's challenge, Finch replied to his charges as follows: "The specification of offences which accompany your letter are those growing out of official station, and only such as an uniformed and young officer would presume to allege as a pretext for personal reparation. The remedy for the cases cited is to be found both in the act organizing and usage governing the service. An officer, therefore, having its interests at heart, ought at the moment to have referred for protection or satisfaction to the proper tribunal. But you, on the contrary, cherish to this distant day imaginary wrongs, and claim reparation because you have indiscreetly expressed a determination to do so. The only pretence for your conduct is to be found in your fourth specification; to which I shall make no reply, or take further notice, than that Lieutenant Legge is dead, for whose memory I cherish a high regard."

The duel was fought on Castle Island in Boston harbor, on September 26, 1819, and resulted in the death of White. There is said to be a monument to White's memory on this island. Subsequently Finch changed his name to Bolton and he became a post-captain of the navy.[36]

[35] Captains' Letters, 1819, I, No. 85.

[36] Sabine, *Duels and Duelling,* 308-310; *Army and Navy Journal,* Oct. 31, 1868.

35. 1819. Midshipman J. S. Cannon and Midshipman William Pierson.

These young officers are reported to have fought a duel in 1819 at or near Havana, while they were attached to the U. S. S. *John Adams*. Sabine's statement that Cannon was "killed on the spot" is erroneous."

36. (1819). Lieutenant Josiah Tattnall and ————.

37. (1819). Midshipman Richard S. Pinckney and ————.

Tattnall and Pinckney were officers of the U. S. S. *Macedonian*, Captain John Downes, which vessel in 1819 was stationed on the west coast of South America. The navy of Chile at that time was largely officered by Englishmen, its commander, Lord Cochrane, being of that nationality. Englishmen, both at home and abroad, for a decade after the War of 1812, bore our naval officers an ill-will because of the American victories at sea in that conflict, and our officers were quick to resent any slight or insult given them by their late adversaries. When, therefore, one of Lord Cochrane's officers at Valparaiso used language which Tattnall considered offensive, he promptly received a challenge from Tattnall to a duel. He accepted the challenge, and retired from the field with a bullet in his shoulder. Later Pinckney got into trouble at an evening party at a hotel in Valparaiso. During an animated discussion with some of Cochrane's officers, the young midshipman denounced their commander-in-chief, and a personal quarrel ensued. He challenged his opponent, and a duel was agreed upon. According to the preliminary arrangements each principal had the right to choose two "friends." One of Pinckney's friends was Lieutenant Tattnall. The duel was fought on a clear moon-light night on the sea-beach, in the presence of hundreds of spectators. After the principals had taken their positions, ten paces apart, one of the friends of the Englishman declined to permit the fight to proceed in accordance with the terms agreed upon, but insisted that the distance should be five paces, since he had heard that Pinckney was a dead shot. Tattnall settled this controversy by calling the dissatisfied friend of the Englishman a scoundrel and challenging him to a duel at five paces. He thereupon yielded his point, and Pinckney's fight took place in accordance with the stipulated terms. Several shots were exchanged. The clothing of both principals was cut and

" Sabine, *Duels and Duelling*, 84.

the Englishman was wounded. A reconciliation brought the duel to an amicable close.[88]

38. *(1819). Midshipman J. M. Boardley and ———. Boardley was killed in this duel.[89]

39. 1819. Purser Benjamin F. Bourne and Captain Ralph Johnson (of the 64th Regiment of Foot, of the British Army).

40. 1819. Surgeon's Mate A. M. Montgomery and Captain J. E. Freeth (of the 64th Regiment of Foot, of the British Army).

41. 1819. Lieutenant Robert F. Stockton and Captain Ralph Johnson (of the 64th Regiment of Foot, of the British Army).

42. 1820. Lieutenant Samuel W. Downing and Lieutenant Thomas Smith (of the 27th Regiment of Foot, of the British Army).

These four duels were the result of the bitter feelings that existed in 1819-1820 between the officers of the Mediterranean squadron and the officers of the British garrison at Gibraltar. Their quarrels began in the spring of the former year. On the night of March 22, 1819, the captain of an American merchantman, named Taylor, when returning to his lodgings was arrested by a guard, and was confined in a loathsome prison by order of Captain Ralph Johnson. Several respectable merchants interfered and Taylor was released; thereupon he demanded satisfaction of Johnson who refused to give it on the ground of disparity of rank. On leaving Gibraltar, his cause was espoused by some of the American officers of the squadron and especially by Purser B. F. Bourne of the U. S. S. *Erie,* who challenged Johnson.

Not long after Taylor's arrest, another offense was committed by the British. On the night of March 30 Purser A. Y. Humphreys of the U. S. S. *United States,* when returning to his ship, was for a time refused a passage through the gate of the Ragged Staff Guard by Ensign H. A. Nutt, and was subjected to humiliating treatment. On being challenged by Humphreys, Nutt refused to fight. On the next day Humphrey's ship sailed, and his cause was championed by Dr. A. M. Montgomery of the *Erie.* On the 31st Montgomery and several of his friends visited the messroom of the 64th Regiment to "post" Nutt, and were received with derision by the British officers. Greatly angered, the Americans offered to fight any officer of the regiment. Hear-

[88] Jones, *Life of Commodore Josiah Tattnall,* 24-25.

[89] Register of the Navy (MS., Archives of the Navy Department).

ing no reply, they called the whole regiment a parcel of cowards. Captain Freeth then stepped forward for the honor of his fellow-officers, and declared his willingness to fight any one of the Americans on the next day. His challenge was accepted by Montgomery, who had previously acted as the friend of Humphreys. The duels between Bourne and Johnson and Montgomery and Freeth took place early in the morning of April 1, at the Neutral Ground, near Gibraltar. Bourne was wounded in the groin, and Freeth in the hip; but neither fatally.

Notwithstanding that the British commander forbade his officers to leave the garrison, and that Captain H. E. Ballard of the *Erie* gave orders that none of his officers should leave their ship, Lieutenant Stockton, who had acted as the second of Bourne, and who had taken offense at Captain Johnson for addressing some opprobrious language to Bourne, challenged the captain. They met on the rock at St. Michael's Cave, Stockton being accompanied by Bourne and Dr. John W. Peaco. After a single shot had been exchanged without effect, the duelists were compelled to disperse by a party of soldiers sent to seize them. The *Erie* shortly sailed for Algeciras, and the disputes for a time came to an end.

After about a year had elapsed, a fourth duel took place. This time Lieutenant Thomas Smith, of the 27th Regiment of Foot, was the challenger. The gauntlet was reluctantly accepted by Lieutenant Samuel W. Downing of the frigate *Guerriere*, Captain Charles C. B. Thompson. The duel occurred at 3 o'clock p. m., of March 11, 1820, on the Neutral Ground. About a dozen British officers were present. Downing was accompanied by Lieutenants Allen B. W. Griffin and Bladen Dulaney. Three shots were fired. Each time Downing wounded his antagonist, the last time severely. The success of the Americans inflamed the British, and notwithstanding that Governor Don interdicted all intercourse between the garrison and the squadron, Captain Johnson and a doctor of the 64th Regiment visited the *Guerriere* and presented the captain of the vessel and Lieutenant Downing with challenges from officers of the garrison. It now appeared that the unmarried British officers of the garrison had entered into a combination to call out all the officers of the *Guerriere* on terms most unfavorable to them. Fortunately, before arrangements for further duels could be perfected, the *Guerriere* sailed

from Gibraltar. A little later our naval station was removed from Gibraltar to Port Mahon, and the opportunities for dueling with British officers at the former port were greatly lessened.*

43. *1820. Commodore James Barron and Commodore Stephen Decatur.

Of all the duels fought by our naval officers, the one between Barron and Decatur is by far the most celebrated. It was the only duel in which both principals were of the highest naval rank. Barron was but two numbers from the head of the navy list, and Decatur five. Barron lived at Hampton, Virginia, having for thirteen years performed no naval duties. Decatur resided at Washington, and was one of the three naval commissioners who assisted the Secretary of the Navy in administering the service. He was a gallant, chivalrous, and high-spirited man, and possibly the most brilliant officer of the Old Navy.

This duel was one of the sequels of the fight between the U. S. frigate *Chesapeake* and the British ship of war *Leopard*. It is recollected that the *Chesapeake* was commanded by Barron, that she sailed from Norfolk on the morning of June 22, 1807, that soon after getting to sea she was overhauled by the *Leopard*, whose commander demanded Barron to deliver up certain British deserters, that Barron refused to comply with the demand, that the *Leopard* thereupon opened fire upon him inflicting severe losses, and that he was unable to return the fire owing to the unpreparedness of his ship and the confusion on board her. For his failure to make a defense he was tried by a court-martial early in 1808 and was sentenced to suspension from the navy for five years, with loss of pay. Decatur was a member of this court. Before it convened he wrote to the Secretary of the Navy and asked to be excused from service on the ground that he had attended the court of enquiry that had presented charges against Barron and that he had there formed an opinion unfavorable to the accused officer. The Secretary, however, declined to excuse him. Still hoping that he might be relieved from the service, he sent a copy of his correspondence with the Secretary to Barron's counsel in order that Barron might have an opportunity to protest against his sitting on the court. That officer, however, did not see fit to challenge him.

* Captains' Letters, 1819, III, No. 62; Officers' Letters, 1820, II, No. 62; *Niles' Register*, XVII, 178; XVIII, 271-272; Life of R. F. Stockton, 33-35; *Edinburgh Annual Register*, 1819, 314-315.

Barron soon after his trial and suspension entered the merchant service and went abroad. Notwithstanding that his term of suspension expired in February, 1813, he remained abroad throughout the War of 1812. On his return to the United States in 1818 he sought service in the navy. His claims were resisted by every captain, except one, Captain Jesse D. Elliott, on the ground that an imputation lay against him for not fighting for his country in her hour of need. Decatur took a prominent part in opposing Barron's restoration to duty, holding that his conduct since the affair of the *Chesapeake* and the *Leopard* ought to bar forever his re-admission to the service. It should be said that Barron, when his term of suspension expired, applied to the Navy Department for service by letter, but received no reply, that he always regarded his sentence by the court-martial as "cruel and unmerited," and that he felt that the principal officers of the navy by refusing him naval service were adding to the injuries they had done him in the past. Brooding over his wrongs, real or imaginary, he became unduly sensitive, and disposed, if an occasion arose, to seek redress from his enemies. Chief of these was Decatur.

An extensive correspondence between the two officers began with the following note of Barron, dated Hampton, Virginia, June 12, 1819: "I have been informed in Norfolk that you have said that you could insult me with impunity, or words to that effect. If you have said so, you will, no doubt, avow it, and I shall expect to hear from you." Decatur replied as follows: "I have received your communication of the 12th inst. Before you could have been entitled to the information you have asked of me, you should have given the name of your informer. That frankness which ought to characterize our profession required it. I shall not, however, refuse to answer you on that account, but shall be as candid in my communication to you as your letter or the case will warrant. Whatever I may have *thought or said in the very frequent and free conversation I have had respecting you and your conduct,* I feel a thorough conviction that I never could have been guilty of so much egotism as to say that 'I could insult you' (or any other man) 'with impunity.'" While Decatur, with much circumlocution, practically denied using the words attributed to him, his letter was most exasperating and well calculated to increase the bitterness of Barron. That officer,

however, accepted Decatur's explanation, as may be seen from the following sentence of his reply: "Your declaration, if I understand it correctly, relieves my mind from the apprehension that you had so degraded my character as I have been induced to allege." A brief, sharply-worded note of Decatur brought the first installment of the correspondence to a close.

Some four months later Barron renewed the correspondence in a letter dated October 23, 1819. He now asserted that Decatur for many years had endeavored to ruin his reputation, that Decatur had sent their recent correspondence to Norfolk to be shown to some of his particular friends with a view to alienating from him their attachment, and that Decatur had "tauntingly and boastingly" observed that he would cheerfully meet him in the field and hoped that he would act like a man—or words to that effect. Such conduct, Barron said, calls loudly for redress. "I consider you as having given the invitation, which I accept, and will prepare to meet you at such time and place as our respective friends, hereafter to be named, shall designate. I also, under all the circumstances of the case, consider myself entitled to the choice of weapons, place, and distance; but should a difference of opinion be entertained by our friends, I flatter myself, from your known personal courage, that you would disdain any unfair advantage, which your superiority in the use of the pistol, and the natural defect of my vision, increased by age, would give you."

It may be seen from this letter that Barron had decided to fight Decatur, but that he was unwilling to give his adversary the advantage of being the challenged person—namely, the choice of time, grounds, weapons, and distance. He was resolved to have the terms as favorable to himself as possible. As the one aggrieved, the challenge should have proceeded from Barron. Nor was he warranted in considering Decatur's conduct and language as an invitation to a duel.

Decatur's reply to Barron's letter, and Barron's rejoinder are lengthy documents, largely explanatory of their opinions and conduct since 1807. Each made many accusations against the other which he could not prove. Decatur denied explicitly that he had invited Barron to the field or that he had expressed a hope that Barron would call him out. He said that he would be much better pleased, on all scores, to have nothing to do with Barron,

and that he would regret the necessity of having to fight a duel with anyone. "But, in my opinion," he added, "the man who makes arms his profession is not at liberty to decline an invitation from any person, who is not so far degraded as to be beneath his notice. Having incautiously said I would meet you, I will not consider this to be your case, although many think so; and if I had not pledged myself, I might reconsider the case." Decatur's language here, as may be seen, was insolent and exasperating, to say the least. On the subject of dueling, Barron wrote in reply, "I perfectly coincide with the opinions you have expressed. I consider it a barbarous practice, which ought to be exploded from civilized society. But, sir, there may be cases of such extraordinary and aggravated insult and injury, received by an individual, as to render an appeal to arms on his part absolutely necessary. Mine, I conceive to be a case of that description; and I feel myself constrained, by every tie that binds me to society, by all that can make life desirable to me, to resort to this mode of obtaining that redress due to me at your hands, as the only alternative which now seems to present itself for the preservation of my honor."

Decatur, in his reply to the letter of Barron, from which we have just quoted reiterated his statement that he had not challenged him and said that he did not intend to challenge him. "If we fight," he declared, "it must be of your seeking." His letter closed with the following sentence: "I have now to inform you that I shall pay no further attention to any communication you may make to me, other than a direct call to the field." Barron's answer to this declaration was as follows: "Whenever you will consent to meet me on fair and equal grounds, that is such as two honorable men may consider just and proper, you are at liberty to view this as that call." Decatur accepted Barron's challenge in a brief note dated January 24, 1820.

Barron chose Captain Jesse D. Elliott as his second. Decatur after having asked Commodore John Rodgers and several other officers of high rank to serve as his second and having received their refusals, chose Commodore William Bainbridge. Bainbridge was number four on the captains' list; Elliott was at the foot of the list. Both officers had seen important service during the recent war with Great Britain. Bainbridge was one of the most illustrious officers of the Old Navy. Elliott is celebrated

for his venomous quarrel with Commodore O. H. Perry over their respective shares of credit for the victory at the battle of Lake Erie; the death of Perry had prevented a duel between them. On March 8 Elliott visited Bainbridge on board his ship, the *Columbus*, anchored in the Potomac, some distance below Washington, for the purpose of making the final arrangements for the meeting. On that day, which happened to be the anniversary of Decatur's wedding, they signed the following agreement: "It is agreed by the undersigned, as friends of Commodore Decatur and Commodore Barron, that the meeting, which is to take place between the said Commodore Decatur and Commodore Barron, shall take place at nine a. m., on the 22d instant, at Bladensburg, near the District of Columbia, and that the weapons shall be pistols; the distance, eight paces or yards; that, previously to firing, the parties shall be directed to present, and shall not fire before the word 'one' is given, or after the word 'three;' and that the words 'one,' 'two,' 'three,' shall be given by Commodore Bainbridge." The fixing of the distance at eight yards instead of ten, the usual distance, was the work of Bainbridge, nor does it appear that in reaching a decision he was moved by Elliott who urged that the distance should be a short one owing to the defective vision of Barron. It is said that this reduction caused Decatur to reconsider his original intention not to return Barron's fire and to decide to wound him in some part not vital.

Decatur rose at an early hour on the morning of March 22, walked from his residence on Lafayette Square, down Pennsylvania Avenue to Beale's Hotel, on Capitol Hill, and there breakfasted with Bainbridge and Purser Samuel Hambleton, of the navy. At breakfast he spoke of signing his will, but deferred it since a third person would be needed and to call any one in for such purpose might arouse suspicion. "He was quite cheerful," Hambleton said, "and did not appear to have any desire to take the life of his antagonist; indeed he declared that he should be very sorry to do so." As soon as the meal was eaten the party started in a carriage toward the dueling-grounds. Of the subsequent events Hambleton wrote as follows:

"On arriving at a valley, half a mile short of Bladensburg, we halted, and found Captain Elliott standing in the road, on the brow of the hill beyond us. Commodore Bainbridge and myself walked up, and gave him

the necessary information, when he returned to the village. In a short time Commodore Barron, Captain Elliott, his second, and Mr. Latimer arrived on the ground, which was measured (eight long strides), and marked by Commodore Bainbridge, nearly north and south, and the seconds proceeded to load. Commodore Bainbridge won the choice of stands, and his friend chose that to the north, being a few inches lower than the other.

"On taking their stands Commodore Bainbridge told them to observe that he should give the words quick, 'Present, one, two, three'; and that they were not, at their peril, to fire before the word 'one' nor after the word 'three' was pronounced. Commodore Barron asked him if he had any objection to pronouncing the words as he intended to give them. He said that he had not, and did so.

"Commodore Barron, about this moment, observed to his antagonist, that he hoped, on meeting in another world they would be better friends than they had been in this; to which Commodore Decatur merely replied 'I have never been your enemy, sir.' Nothing further passed between them previous to firing. Soon after, Commodore Bainbridge cautioned them to be ready, crossed over to the left of his friend, and gave the words of command, precisely as before; and at the word 'two,' they both fired, so nearly together that but one report was heard.

"They both fell nearly at the same instant. Commodore Decatur was raised and supported a short distance, and sank down near where Commodore Barron lay; and both of them appeared to think themselves mortally wounded. Commodore Barron declared that everything had been conducted in the most honorable manner, and told Commodore Decatur that he forgave him from the bottom of his heart. Soon after this, a number of gentlemen coming up, I went after our carriage."

Four of the gentlemen mentioned by Purser Hambleton were Decatur's friends, Commodores John Rodgers and David Porter, his fellow-commissioners at the navy board, and Surgeons Bailey Washington and Samuel R. Trevett. From the accounts that Porter and Washington gave of the duel it would appear that the two wounded officers continued their conversation after Hambleton left the grounds for the carriage. Attorney-General Wirt, who, it would seem, talked with Porter and Washington, wrote of the duel as follows eleven days after it:

"Very different was the scene when he [Porter] got to the ground. Decatur was apparently shot dead; he revived after a while, and he and Barron held a parley as they lay on the ground. Doctor Washington, who got up just then, says that it reminded him of the closing scene of a tragedy—Hamlet and Laertes. Barron proposed that they should make friends before they met in Heaven (for he supposed they would both die immediately). Decatur said he had never been his enemy, that he freely forgave him his death, though he could not forgive those who had stimu-

lated him to seek his life. One report says that Barron exclaimed, 'Would to God you had said thus much yesterday.' It is certain that the parley was a friendly one, and that they parted in peace. Decatur knew that he was to die, and his only sorrow was that he had not died in the service of his country."

Commodore Rodgers, with the aid of Surgeon Trevett, helped Decatur to his carriage; and supporting him in his arms had him driven to his home, on Lafayette Square, in Washington, which was reached at half past ten. Rodgers remained at his bedside until his death, about twelve hours later. He was one of the witnesses of Decatur's will which was signed a few hours before he died. Commodores Rodgers, Tingey, Porter, Macdonough, and Chauncey served as pallbearers at the unfortunate officer's funeral, one of the largest ever held at the capital.

Barron soon recovered from his wound and lived until 1851. For the last thirteen years of his life he was the senior officer of the navy. After the duel he served as the commandant of the Norfolk and of the Philadelphia navy yards, and as governor of the naval asylum at Philadelphia, but he never went to sea in command of a ship of war. Until the end he was a discredited officer, and to this day a stigma is attached to his name. At first, public sentiment condemned him severely for the part which he had played in the duel, but later it became more favorable to him. The verdict of history on the chief points involved in the complicated quarrel between the two officers may be in the end somewhat as follows: that Barron was severely, though probably not unjustly, punished for his offense in the fight between the *Chesapeake* and *Leopard;* that Barron's reason for not returning to the United States during the War of 1812, namely, that he had not sufficient means to pay his fare home, is not satisfactory; that the resistance of his fellow-captains to his restoration to duty in 1818-1820 was not justifiable; that in the events that led to his duel with Decatur he was the aggressor; and that Decatur's conduct and correspondence were well fitted to inflame and incite the passion of Barron for whom he showed a decided hostility.[41]

44. *1820. Midshipman Cyrus A. Branch and ———.

Midshipman Branch was killed in a duel at Havana, on May 15, 1820.[42]

[41] Mackenzie, *Stephen Decatur*, 305-334, 398-441; Sabine, *Duels and Dueling*, 141-163; Kennedy, *William Wirt*, II, 105-106.

[42] Register of the Navy (MS., Navy Department Archives).

45. 1821. ——— and ———.

The following concise note of this duel may be found in *Niles' Register* for March 31, 1821: "Shooting! Two officers of the marine corps have lately amused themselves by shooting at one another near Bladensburg, by which one of them received a ball in his thigh."[44]

46. 1822. Midshipman Samuel B. Cocke and Mr. William Gibson.

Gibson was a clerk in the Treasury Department, at Washington, D. C., near which city the duel occurred. Gibson was unhurt, Cocke was shot through the lungs.[45]

47. *1822. Midshipman Thomas B. Worthington and Midshipman Samuel Gaillard.

48. 1822. Midshipman John D. Bird and ———.

49. 1822. Surgeon Wilmot F. Rodgers and ———.

These three duels resulted from disputes among the younger officers of the Mediterranean squadron. They were chiefly promoted by Midshipman John S. Paine, who acted as a second in each of them. The meeting between Worthington and Gaillard took place at Port Mahon on February 4, 1822. Paine was the second of Gaillard. Worthington was killed.[46]

50. *1824. Midshipman Edward A. Kerr and Midshipman Joshua Barney.

These two young officers were attached to the U. S. S. *Ontario*, Master Commandant John B. Nicholson, one of the vessels of the Mediterranean squadron. The cause of their duel was Barney's popularity with his superior officers. On one occasion at Tangier, he alone of the midshipmen was invited by the lieutenants of the ship to go ashore. This partiality caused Kerr to refer to Barney as a "boot-lick" and "curry-favorer." Barney, on learning that Kerr had used these epithets, challenged him, and Kerr accepted the challenge. The seconds were Midshipmen James H. Rowan and John W. Hunt. Surgeon's Mate Robert P. Macomber and Midshipman William M. Glendy were also members of the dueling party. Glendy went as a friend of Hunt, who had engaged to fight Rowan immediately after the Barney-Kerr duel. Macomber was to render professional service in case

[44] *Niles' Register*, XX, 80.
[45] Sabine, *Duels and Duelling*, 126-127.
[46] Captains' Letters, 1822, I, No. 24.

he was needed. The duel was fought on November 11, 1824, on the Neutral Ground, near Gibraltar, with pistols, at a distance of ten paces. Neither of the principals was hurt at the first fire. The duelists again took their places and the word was again given. Kerr fell mortally wounded in the chest and died instantly. It was asserted that after the first fire he wished to seek a reconciliation, but was prevented by Midshipman Glendy. This distressing fatality brought to an end the program of the party, the members of which were shortly arrested by a Spanish guard. Captain John Orde Creighton, the commander-in-chief of the Mediterranean squadron, sent the five survivors home to report to the department. As a preventive of dueling, he recommended to the Secretary of the Navy that each officer on entering the service should be required to take a pledge that he would not be concerned in a duel.[46]

51. (1824). Midshipman ——— and Midshipman ———.

About 1824 a duel was fought near Norfolk by two midshipmen of the U. S. S. *Hornet*, neither one of whom was injured. The duel was caused by one of the midshipmen throwing the contents of an ink bottle on the new vest of the other, who had persisted in sprinkling with water a letter which the angered youngster was writing.[47]

52. 1825. Midshipman James B. Glentworth and Midshipman John W. Mooers.

These young officers fought a duel at Syracuse on January 14, 1825. Their seconds were Midshipmen Samuel Swartout and Henry W. Morris. The four offending midshipmen were dismissed from the Mediterranean squadron by its commander-in-chief, Commodore Thomas Macdonough.[48]

53. *1825. Midshipman C. F. Shoemaker and Midshipman ———.

Shoemaker was killed in a duel fought near Norfolk on September 23 (or 22), 1824. *Niles' Register* contains the following notice of this fatal meeting: "Two boys, midshipmen, attached to the *Constellation* frigate, amused themselves by shooting at one another, on the 22d ult., at Fort Nelson, by which one of

[46] Supplemental Volume of Letters (MS., Navy Department Archives), 1812-1890, Nos. 35-44.

[47] *Southern Literary Messenger*, 1842, pp. 768-769.

[48] Captains' Letters, 1825, I. No. 39.

them was killed, and the other has the pleasure to say that he has slain a brother!"[49]

54. 1827. Midshipman Charles B. Childs and Midshipman John E. Holt.

This duel was fought in April, 1827, near Norfolk. Childs received a flesh wound in the right hip.[50]

55. *1827. Surgeon's Mate T. J. Bradner and ————.

Bradner was killed in a duel on August 23, 1827.[51]

56. 1829. Midshipman Alexander McClung and Midshipman Addison C. Hinton.

McClung and Hinton were officers of the U. S. S. *Vandalia*, one of the vessels of the Brazil squadron. McClung was a Kentuckian, and a "regular fire eater." He entered the service under the impression that it was necessary to fight his way through it, which he proceeded to do. Early one morning he and Hinton went ashore at Montevideo in the market-boat of the ship, and exchanged shots near the walls of that city. Hinton was wounded in the thumb of the right hand. McClung received a painful flesh wound in the right arm, which so disabled him that he was unable to fight a duel with Midshipman J. T. Williams, for which arrangements had been made. The wounds received by the young men would have been more serious had it not been for the fortunate circumstance that the powder used was obtained from the natives and was of an inferior quality. McClung was sent to the United States under a pledge that he would resign immediately upon his arrival, which he did—August, 1829.[52]

57. *1830. Passed Midshipman Charles G. Hunter and Mr. William Miller, Jr.

Miller was a talented young lawyer, of Philadelphia. Neither he nor Hunter was connected with the quarrel that was the remote cause of the duel. Towards the close of the year 1829 Mr. H. Wharton Griffith made a remark at a dinner party, given at or near Philadelphia, that was considered offensive by Mr. Roger Dillon Drake, who resented it. This dispute, however, was amicably settled as a result of the intervention of the friends of

[49] *Niles' Register*, XXIX, 79.
[50] Captains' Letters, 1827, II, No. 59.
[51] Navy Register (MS., Navy Department Archives).
[52] Sands, *From Reefer to Rear-Admiral*, 35-37.

the two men. Early in 1830 Dr. Alfred Drake, a brother of R. D. Drake, received an anonymous letter, reflecting, as he thought, upon his fiancé; and he charged Griffith with writing it. Griffith denied the charge, and shortly sent a challenge to Drake, who refused to accept it. Midshipman Charles H. Duryee now appeared on the scene as the friend of Griffith, and William Miller as the friend of Drake. Duryee denounced Drake and was challenged by him. Lieutenant Hampton Westcott now made his appearance as the friend of Duryee; and, having decided views as to the proprieties of dueling, he declared that Duryee should not meet Drake until Drake had met Griffith. On March 7, 1830, five gentlemen of New Brunswick, New Jersey, representing themselves as friends of Duryee, wrote a letter to Miller asking for a joint conference of the friends of Duryee and Drake, and Miller replied to it refusing to reopen the controversy. Midshipman Charles G. Hunter now appeared as the friend of Duryee. He visited Miller and obtained his promise to burn all the copies of the New Brunswick letter, as that communication was offensive to Duryee, notwithstanding his friends, or supposed friends, had written it. After Miller had burned all the copies that were thought to exist, the letter appeared in print, and Hunter, greatly offended, held Miller responsible for its publication, and challenged him. At first Miller refused to accept the challenge, but on being posted as a coward he agreed to meet his adversary. Hunter's second was Lieutenant Hampton Westcott; Miller's, Lieutenant Edmund Byrne. Several friends of the principals and a surgeon accompanied the dueling party. The meeting took place on Sunday, March 21, 1830, on the boundary between Delaware and Pennsylvania, near Chester, on the southern bank of Naaman's Creek. At the first fire Miller fell and expired almost instantly, the ball of his adversary having passed through his lungs. Hunter advanced, and as he looked at the prostrate form of Miller, said, "Gentlemen, I assure you that I had no enmity against that man. His blood must rest upon the heads of others who dragged him into this quarrel."

The duel caused much excitement at Philadelphia, and throughout the nation, and Hunter was denounced as a murderer. On March 27 the Pennsylvania House of Representatives resolved that the President should be asked to dismiss the surviving principal from the navy. On March 30 Secretary of the Navy

Branch recommended that the names of Hunter, Byrne, Westcott, and Duryee should be erased from the list of officers of the navy, and on the next day President Jackson, responding to public sentiment, endorsed the recommendation with these words: "Let the above-named officers of the navy be stricken from the roll." A year or two later the four officers were reinstated, Westcott and Byrne being nominated by the President and confirmed by the Senate. Hunter, during our war with Mexico, acting on his own responsibility, captured Alvarado in a gallant exploit, and won the sobriquet of "Alvarado Hunter."[58]

58. *1830. Lieutenant Joshua R. Sands and Surgeon H Willis Bassett.

Sands and Bassett were attached to the U. S. S. *Vandalia,* one of the vessels of the Brazil squadron. A quarrel between them arose at Montevideo. While the ship was at that port several of the wardroom officers, including Sands, became acquainted with Mr. Francis Markoe, a young lawyer from Philadelphia, whom they invited to live on board the *Vandalia* as their guest, thinking that thereby they could make their friend more comfortable and at the same time enjoy more frequently his society. Bassett alone objected to the arrangement, and he lost no opportunity to make spiteful remarks, which gave rise to some disagreeable scenes in the wardroom. On one such occasion, Sands ordered the surgeon to his room. Finally Bassett sent Sands a challenge, which he refused, as he was the first lieutenant of the *Vandalia.* For the executive officer of a ship to fight one of his subordinate officers constituted a serious breach of discipline. Sands and Bassett now perferred charges against each other, and they were tried by a court-martial. Sands was acquitted, but Bassett was sentenced to be dismissed from the squadron and to report himself personally at Washington.

On his dismissal Bassett went ashore to Rio Janeiro, and again challenged Sands, urging that as he was now detached from the ship, Sands' previous objections were no longer tenable. The duel occurred on the morning of August 20, 1830, upon the beach at Praya Grande, Rio Janeiro, abreast the anchorage of the *Vandalia.* Sands' second was Assistant Surgeon William Johnson; and Bassett's, Acting Sailing Master H. E. V. Robinson. Sands

[58] Scharf, *History of Philadelphia,* I, 626-627; Sabine, *Duels and Duelling,* 245; *American Sentinel* (Philadelphia), March 24, 30, 1830; Investigation of the Late Philadelphia Duel (1830).

twice tried to settle the difficulty amicably after reaching the grounds, but Bassett insisted that the duel should be fought. On exchanging shots, the lieutenant stood unhurt, but the surgeon had fallen. He soon expired, having received the ball of his adversary just above the heart. The surviving principal and the two seconds were ordered home to answer for their conduct to the department. Sands later became a rear-admiral of the navy.[54]

59. 1830. Midshipman ——— and Midshipman ———.

60. 1830. Midshipman ——— and Midshipman ———.

61. 1830. Midshipman ——— and Midshipman ———.

These duels were fought in 1830, in the Mediterranean, by the Midshipmen of the U. S. S. *Constellation*. Schoolmaster E. C. Wines of that ship wrote of them as follows: "The first week in the year was also signalized by two duels (bloodless and honorable!), fought by midshipmen attached to the *Constellation*. 'Brutus is an honorable man; so are they all—all honorable men.' The midshipmen are fond of distinguishing themselves on the field of honor. Many duels were fought by them while the *Constellation* was up the Straits. They were generally without any disastrous consequences; but, when we were at Smyrna, one of the most desperate and shocking affairs of this kind took place of which I ever heard. The parties fought with ships' pistols, at the distance of only five paces from each other, under the engagement that, if the first fire missed, they should advance to a second, and place their pistols breast to breast. The pistol of only one of the combatants went off, and its ball passed through the thigh of the other, mangling the flesh and shattering the bone in a most dreadful manner. Five months afterwards, when we left the Mediterranean, the poor sufferer was still on his back, and if he ever recovers, will be a cripple for life."[55]

62. 1831. Midshipman W. C. Spencer and Assistant Surgeon Euclid Borland.

This duel occurred at Port Mahon, island of Minorca, in December, 1831. Both the principals and the seconds, Midshipmen John Weems and Robert J. Ross, were officers of the U. S. S.

[54] Sands, *From Reefer to Rear-Admiral*, 37-40; Captains' Letters, Aug. 1830, Nos. 57, 65; *Niles' Register*, XXXIX. 141.

[55] Wines, *Two Years and a Half in the Navy*, I, 153-154.

John Adams, Master Commander P. F. Voorhees. There were no fatalities.[36]

63. *1835. Midshipman John Banister and Midshipman William T. Smith.

Banister and Smith were officers of the U. S. S. *Natchez*, Master Commandant J. P. Zantzinger. A quarrel arose between Midshipman Smith and Midshipman Francis E. Baker, in which the latter made use of rough language. Banister espoused the cause of Baker. The duel took place on the beach at Rio Janeiro, on May 12, 1835. Banister was mortally wounded, and died on June 3.[37]

64. 1835. Passed Midshipman William Leigh and Passed Midshipman John Weems.

Leigh and Weems were attached to the U. S. S. *Peacock*, bound in the summer of 1835 for the East Indies. While their ship was at Rio Janeiro the young men went ashore and fought a duel, in which Leigh was wounded in the calves of his legs.[38]

65. *1835. Lieutenant David R. Stewart and Acting Lieutenant Thomas Turner.

Stewart and Turner were officers of the U. S. S. *Delaware*, Captain J. B. Nicholson, which vessel in 1835 was attached to the Mediterranean squadron. An altercation between the two lieutenants arose one evening when they were discussing the events of a trip ashore to Girgenti on the previous day. Turner remarked that Girgenti might be called the Botany Bay of Italy. Stewart denied the correctness of this assertion. One word led to another. Both became angry. Finally Turner, who had a grievance against Stewart, called him a liar and challenged him. Stewart's second was Lieutenant William H. Gardner, of the *John Adams;* Turner's, Lieutenant John H. Marshall, of the *Delaware*. Gardner tried to prevent the duel. It took place on August 5, 1835, on the seashore, about a mile from the Mole harbor at Girgenti, Stewart fell mortally wounded, and died on the next day. Both he and Turner were excellent officers.[39]

[36] Captains' Letters, Oct., 1832, Nos. 43-48.

[37] Captains' Letters, May, 1835, No. 55; June, 1835, No. 9; *Niles' Register*, XLIX, 51.

[38] *Army and Navy Chronicle*, 1835, p. 311. The report published in 1835 that three duels were fought at Rio Janeiro by the officers of the *Peacock* is erroneous.

[39] Captains' Letters, Aug., 1835, Nos. 89-93, 95-97; *Niles' Register*, XLIX, 140.

66. 1835. Passed Midshipman C. C. Barton and Passed Midshipman H. P. T. Wood.

Wood was an officer of the U. S. S. *Constitution*, and Barton, of the U. S. S. *Shark*. Both were quarrelsome young men. The two seconds were Midshipmen James T. McDonough and William S. Ringgold. The latter tried to settle the difficulty amicably, but Wood insisted upon a fight. The duel occurred in the Mediterranean on December 1, 1835.[80]

67. (1835). Midshipman William May and Midshipman ——Baldwin.

In this duel Baldwin was wounded.[81]

68. *(1835). Midshipman ——— and Midshipman ——.

This duel was fought by two youngsters of the navy, intimate friends, in the southern part of the Malay peninsula. Their sleeping cots were close to each other, and one warm night they quarreled over the question of leaving open or closing the scuttle. The dispute was finally settled amicably and to the satisfaction of the young men by exchanging cots. A superior officer, however, who overheard their heated words, and who was exceedingly sensitive as to points of honor, made it plain to one of the midshipmen that if he wished to maintain the respect of his fellow-officers he would have to call out his friend who had spoken so harshly to him. On consulting with other officers he found that they were also of the opinion that nothing less than a duel would satisfy the proprieties, and that if he did not fight they would no longer associate with him. To avoid ostracism and to conform to the standards of honor imposed upon him by his elders, the young man challenged his friend, and a hostile meeting occurred on shore one evening at six o'clock. Of this meeting and its results he afterwards wrote as follows:

"Upon the signal being given we both fired. In an instant I felt as though I had been electrified, and finding myself wounded was about to lean upon my second's arm, when I perceived my opponent fall upon the sand. My own wound was in the fleshy part of the thigh; it did not prevent my running up to the prostrate figure of my old friend, whose face exhibited intense pain, and kneeling down by his side I implored his forgiveness, which he instantly granted. My despair at his fate knew no bounds; and accusing myself of his murder, I upbraided with the bitterest reproaches those who urged me to send the challenge. I thought no more of myself; all my care was given to the unfortunate victim of absurd

[80] Captains' Letters, Dec., 1835, No. 6; March, 1836, No. 11.
[81] Benjamin, *The United States Naval Academy*, 97.

notions of honor. With great difficulty we removed him to the boat and returned to the ship, when the surgeon minutely examined his wound and pronounced it dangerous. For weeks after, his cot was attended by his late opponent, whose greatest joy was to anticipate his wants; and the only consolation left him is the knowledge that his care preserved his life for a time. The result of this deed upon the prospects of a promising young officer was of a very melancholy description. From the nature of the wound (through the shoulder-joint), it became impossible for him to raise his arm for any serviceable purpose; his professional prospects were blasted forever, and he retired from the service—in which, had he been able to remain, there was every reasonable prospect of his becoming one of its ornaments—to die broken-hearted in his native land."[82]

69. *1836. Midshipman Daniel M. Key and Midshipman John H. Sherburne.

Key was a son of Francis Scott Key, the author of the Star Spangled Banner, and a brother of Phillip Barton Key who was killed in Washington in 1859 by General Daniel E. Sickles; Sherburne was the son of John H. Sherburne, registrar of the Navy Department. Key was the aggressor. He and Sherburne had a meeting in a cornfield near Bladensburg, Maryland, on June 23, 1836. On the dueling ground Sherburne said "Mr. Key, I have no desire to kill you." "No matter," said Key, "I came to kill you." "Very well," replied Sherburne, "I *will* kill you." Key fell at the first fire, and expired almost immediately.[83]

70. *1836. Midshipman Robert Emmet Hooe and Passed Assistant Surgeon George W. Palmer.

Hooe and Palmer were officers of the U. S. brig *Porpoise*, Lieutenant Commandant William Ramsay, which vessel in 1836 was engaged in surveying duties off the coast of Georgia. In this duel or fracas Hooe was the aggressor. He asserted that Palmer in conversation with him used the words, "courtesy as a gentleman ought to teach you better." Palmer said that Hooe had misconstrued his meaning, but confessed that he had used words similar to those quoted. Hooe challenged Palmer, who, apparently, refused to fight. A few weeks later the midshipman accidentally encountered the surgeon at a hospital on shore, at St. Simon, Georgia, where some of the sick men of the ship were quartered. A fight ensued in which Palmer used a pair of tongs and Hooe a pistol. Palmer was mortally wounded, and died on November 6, 1836, about ten days after the encounter.[84]

[82] *Putnam's Monthly Magazine* (1857), X, 256-257.
[83] *Army and Navy Journal*, Oct. 31, 1868; *Niles' Register*, L, 232, 330.
[84] Officers' Letters, Oct., 1836, Nos. 126, 127; Nov., 1836, No. 187.

71. *1836. Midshipman "Talbot" and Midshipman "Bruster."

"Talbot" and "Bruster" are the fictitious names of two midshipmen of the U. S. S. *Constitution*, who fought a duel at Port Mahon in 1836. Midshipman John Newland Maffitt, of the same vessel, was the second of Talbot. A quarrel arose between Talbot and a young midshipman over the wearing of a cloak by the latter, which had been left in Talbot's charge. Talbot slapped the youngster for his offense, and Bruster became his champion. In the duel Bruster was mortally wounded. The commander-in-chief of the Mediterranean squadron sent Talbot home, and a little later he retired from the navy. During the Civil War he fought gallantly under Lee, and was killed at the battle of Antietam. Both he and Bruster were Virginians.[66]

72. 1842. Midshipman A. C. Jackson and Midshipman F. P. Baldwin.

These young men were midshipmen on board the U. S. S. *United States*. They fought a duel at Rio Janeiro in February, 1842, with pocket pistols, at a distance of ten paces. Having fired several shots without hitting each other, they agreed to a reconciliation.[67]

73. 1842. Midshipman James J. Waddell and Midshipman Archibald H. Waring.

Waddell was from North Carolina; and Waring, from South Carolina. They were attached to the U. S. receiving ship *Pennsylvania*, at Norfolk. Their differences were caused by a young lady. The meeting took place on the afternoon of May 27, 1842, on the grounds adjoining the naval hospital, at Norfolk. The principals were attended by Midshipmen Joel S. Kennard and J. P. McFarland. Waddell received a wound in the hip, which gave him a limp for the rest of his life. He afterwards became famous as the commander of the Confederate cruiser *Shenandoah*."[67]

74. 1842. Midshipman Robert A. Knapp and Midshipman Alexander C. Rhind.

Knapp was a student of the naval school at Philadelphia. He left the school without the permission of its superintendent, Com-

[66] Maffit, *John Newland Maffitt*, 41-44.

[67] Franklin, *Memories of a Rear-Admiral*, 38-39.

[67] Captains' Letters, May, 1842, No. 163; *Magazine of American History*, July-Dec., 1891, p. 451.

modore James Barron, and, accompanied by Midshipman John Downes, Jr., as a second, and Midshipman John Guest as a friend, he went to Burlington, New Jersey, where he fought a duel with Rhind on the morning of October 22, 1842. Knapp was severely wounded just below the upper cheek bone.[88]

75. (1842). Midshipman George H. Bier and Midshipman Albert G. Cook.

Bier and Cook were youngsters of the ship of the line *Columbus*, Captain W. C. Spencer, attached to the Mediterranean squadron. Early one morning, about the 1st of January, 1843, they went ashore at Genoa, and fought a duel outside of the city, in front of a country seat, beside the public road, having some twenty or thirty spectators. Bier fell wounded just below the knee, and could not be brought off to the ship until the next morning. The above account is Rear-Admiral Sands' version of the duel. Captain W. H. Parker says that the principals and seconds, all in a single carriage, sought a suitable dueling place; and not reaching the country as soon as they expected, decided to fight in the city. The duel, he says, was fought in one of the streets of Genoa. Mr. Park Benjamin states that the cause of the duel was a trifling disagreement respecting the Queen Dowager of Prussia, which arose during a visit that the Queen paid to the *Columbus*. He gives many of the details of the dispute and of the hostile meeting.[89]

76. 1844. Passed Midshipman William E. Boudinot and Lieutenant Montgomery Hunt.

77. 1844. Passed Midshipman William E. Boudinot and Lieutenant Montgomery Hunt.

Boudinot and Hunt were officers of the East India squadron. They fought two duels within a few days of each other. In the first, which took place on the island of Java, neither was hurt; but in the second, which was fought at Singapore, Hunt was wounded in the thigh at the second fire. The two duelists afterwards became warm friends. Hunt was lost in the *Albany*, in 1854. Boudinot retired from the navy in 1858. He has been credited with being the inventor of the "present signal service system."[90]

[88] Captains' Letters, Oct., 1842, No. 180.

[89] Sands, *From Reefer to Rear-Admiral*, 148; Parker *Recollections of a Naval Officer*, 17; Benjamin, *The United States Naval Academy*, 98-100.

[90] *Magazine of American History*, July-Dec., 1891, p. 451.

78. 1845. Lieutenant William D. Hurst and Passed Midshipman J. B. Creighton.

These men were officers of the U. S. S. *Truxtun*, which vessel in 1845 was attached to the African squadron, then commanded by Commodore M. C. Perry. The duel was caused by a disagreement over some matter of duty on shipboard. Perry blamed Hurst, who was the executive officer of the *Truxtun*, and who invited a challenge from his subordinate officer. The seconds were Acting Master C. S. McDonough and Midshipman William T. Truxtun. The duel occurred at sunrise on November 17, 1845, at West Bay, Princes Island, on the west coast of Africa. A single pistol shot was exchanged. Hurst was wounded in both legs, the principal bone of the left leg being badly fractured. Creighton was uninjured."

79. 1848. Midshipman Walter W. Queen and Midshipman Byrd W. Stevenson.

Queen and Stevenson, and one of the seconds, Midshipman James L. Johnston, were students of the naval school at Annapolis. The other second was a civilian. The naval members of the dueling party left the supper table in advance of their classmates, and repaired to the grounds decided upon. These were "near the battery, within the walls of the school yard." Queen was severely wounded a little above the hip joint. He was carried to his room and Dr. John A. Lockwood was sent for. The midshipmen intended to represent Queen's injury as the result of an accident; the doctor, however, slyly ascertained the true cause of it. While he was silently probing the wound, he suddenly said: "What distance?" "Ten paces," replied two or three middies without stopping to think. Queen, Stevenson, and Johnston were dismissed from the navy by President Polk. Subsequently the two principals were reinstated. The commission of the offense on the grounds of the school, which were under naval government, and within a few hundred yards of the office and residence of Superintendent G. P. Upshur, greatly mortified that worthy officer."

80. 1848. Midshipman Francis G. Dallas and Midshipman John Gale.

" African Squadron Letters (MS., Navy Department Archives), 1843-1845, pp. 418-419.

" Naval Academy Letters (MS., Navy Department Archives), 1848, Nos. 30-46; Parker, *Recollections of a Naval Officer*, 119.

Dallas was a student of the naval school, at Annapolis. Gale had been a student at the school, but had been expelled by a court-martial. The quarrel between the two young men was of long standing. The immediate cause of the duel was the belief of Dallas, for which he had good grounds, that Gale was prejudicing his sweetheart against him, telling her that he was intemperate and was unpopular with his fellow officers. Dallas absented himself from the school without the permission of the superintendent, and repaired to the dueling grounds at Bladensburg, Maryland. His second had no connection with the naval school. Gale's second was Midshipman C. C. Hunter, a student at Annapolis. The duel took place on June 7, 1848. Dallas was wounded, though not seriously. President Polk dismissed the three midshipmen from the navy. Later Dallas and Hunter were reinstated.[73]

81. 1849. Passed Midshipman J. P. Jones and Mr. James Hope.

This duel was fought at Old Point Comfort, Virginia. Hope, it seems, was not a naval officer. Both of the principals were wounded, Hope dangerously. Jones, who was a grandson of Commodore James Barron, used the pistol with which his grandfather killed Decatur.[74]

82. (1850). Lieutenant Charles W. Flusser and ————.

It is said that Flusser fought a duel at Rio Janeiro, and that both he and his antagonist were wounded. It is known that he once had a hostile meeting.[75]

[73] Naval Academy Letters, 1848, Nos. 44, 67, 68.

[74] Sabine, *Duels and Duelling*, 216; *Baltimore Sun*, May 2, 1849.

[75] Flusser Papers (MS., Navy Department Library), Flusser to his mother, April 28, 1862.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NAVAL ECONOMY.

By LIEUTENANT H. E. YARNELL, U. S. Navy.

For several years the navy has been struggling with the problem of reorganization with a view of obtaining a more business-like system of conducting the affairs of the Navy Department, and producing rapid and efficient work at the navy yards. That such a system is needed has been apparent for years, and one of the greatest arguments in its favor has been the delay and waste under the old system. It has been realized that legislation is necessary for such reorganization, and Congress will doubtless pass the necessary laws when a well digested plan is presented by the Navy Department.

It might be well, however, for the navy not to rest on the assumption that nothing can be done in the way of economy of administration until the needed reforms are equalized, but to search for methods of reducing expenses or increasing efficiency which require no Act of Congress to make them possible.

The writer is far from advocating a reduction of expenses when such reduction means a reduction of fighting efficiency. But he does believe that large sums are spent which do not, in any way, further the fighting efficiency of the fleet.

Any economy in which the fleet suffers is false, as by such a course, the whole object for which the navy exists is assailed.

When St. Vincent became First Lord of the Admiralty, in 1801, the excessive economies which he placed in force left the British Navy unprepared for the Napoleonic wars that followed. But it was the unparalleled waste and corruption that existed in the dock yards prior to St. Vincent's term of office that led to his radical reforms, and blinded him to the real needs of the

navy; so that the unpreparedness of 1804 was as much due to former extravagance as to St. Vincent's misdirected economy.

During the years following the Civil War our own naval appropriations were reduced to the lowest limit, nothing was voted for new construction, the personnel stagnated and the object for which the navy exists was lost to sight. All this was dearly paid for in later years, when the necessity for a fighting navy became apparent. While foreign navies had been advancing by a steady wholesome growth, our own was called upon to emerge from a condition of archaic inefficiency and assume a foremost position in a few short years. At once the effect of years of stagnation became apparent. We went abroad for many of the accessories of a man-of-war. Even the plans of some of our earlier vessels were purchased abroad. At the present day we are indebted to foreign countries for torpedoes, boilers, range finders and the method of making armor. And the United States is supposed to be the most inventive nation in the world. Would this condition have existed had the growth of our navy been spread over the years from 1865 to the present time? It is needless to say not, and the present stage of efficiency attained in a few short years lead to interesting reflections as to what might have been accomplished if our navy had been one of gradual increase.

Every nation realizes at the present day that a navy is as necessary as the police force of a city. When the millennium is reached and arbitration replaces all recourse to arms, the necessity for a navy disappears and the vast sums at present spent on military preparation may be diverted to other uses. This is one extreme of naval expenditure.

The other extreme is the appropriation of such sums as will make that nation invincible upon the sea. This extreme is as impracticable as the first owing to the limitation of national incomes. Hence it is between these extremes that the appropriation must fall and the amount that shall be spent is decided upon by the law makers of the country.

The direct responsibility of the naval authorities begins when such sums are turned over to them for the maintenance and increase of the naval establishment and upon them is the burden of proof as to its judicious expenditure.

It is a truism to state that the navy is built for war; hence we

expect that the sums are spent in preparation for that ultimate object. The implements of modern naval warfare are battleships, scouts, destroyers and submarines; with the fleet auxiliaries consisting of colliers, supply ships, repair ships, hospital ships, and the repair stations and bases on shore.

The annual report of the Paymaster-General gives clearly and concisely the manner in which the annual appropriation is expended. In the report for the year ending June 30, 1908, on page 108, is found an interesting table showing the total cost of maintaining ships in commission. From this table it is seen that the total cost of maintaining the fleet was nearly $35,000,000. Can all of the vessels included in this list be classed as effective implements of war, and can the sums spent on doubtful ones be justified?

It appears to the writer that this table offers a great field for argument and as a basis for such argument he has selected the following list of ships which in his opinion could be stricken from the navy list without diminishing in the slightest the effective fighting value of the navy:

Adams	$ 95,395.56	Maintonomah	8,875.46
Alliance	64,834.37	Mohican	147,603.87
Annapolis	74,478.46	Monongahela	217,086.35
Arkansas	118,536.62	Montgomery	116,842.69
Callao	27,282.92	Nevada	123,016.54
Chattanooga	235,987.43	Newark	49,658.65
Chicago	386,760.48	Paducah	125,340.89
Cleveland	223,416.39	Quiros	28,850.79
Concord	152,151.48	Scorpion	72,301.09
Denver	248,959.16	Severn	106,764.05
Des Moines	225,200.54	Supply	145,819.49
Dolphin	145,610.71	Sylph	23,608.01
Dubuque	123,265.57	Tacoma	240,884.55
El Cano	33,062.03	Texas	48,436.29
Eagle	56,082.23	Villalobos	40,661.93
Florida	57,719.38	Wasp	32,209.26
Galveston	226,734.38	Wilmington	176,945.83
Hartford	137,329.19	Wolverine	89,288.29
Helena	159,725.39	Yankton	88,416.16
Marietta	117,227.35	Yorktown	162,592.38
Mayflower	171,121.41		
			$5,128,093.62

The above list is believed to be a very conservative one and that many other vessels might be added.

The assumption is made that a navy is built and maintained for war. Of what possible use are the vessels on this list in case of war? The total fighting value of this unique collection is not equivalent to one 12-inch turret. The six of the vessels of the *Denver* class cost as much to maintain as two battleships, yet the reason for existence of this class of ships has never been satisfactorily explained. They can neither fight nor run away. The total sum spent to maintain the given list of vessels would build one battleship or maintain six in commission.

It may be argued that many of the above vessels are of great service as receiving or training ships, or as gun boats defending American interests in China or in certain unstable Central American governments. If we admit this argument, we must recede from the principle that a navy is built for war only, and assume that it is built for peace also. If this is true then let this sum be separately appropriated for by Congress and labeled "For the defence of American interests in countries with unstable governments." Perhaps this would call the attention of the nation at large to the necessity of regulating the affairs of certain of our next-door neighbors whose domestic affairs are a scandal to the civilized world. It would clear the navy of the burden of a vast indirect expense which is difficult to explain when a war cloud gathers and the nation expects a return in victories and safety, for the vast sums spent for that purpose.

It is apparent from many articles written on the subject of our navy and the number of fighting ships required, that the writers ignore absolutely the cost that such a naval force would entail. The question must be looked at from the pecuniary point of view as well as that of strategy. It is a purely business proposition of obtaining the greatest fighting value from the annual sums that the people of the United States are willing to contribute for the purpose of National defence. That the question of cost is sometimes omitted in the calculations of writers on naval needs is shown in a recent article in which it was stated that to meet the present condition of world politics our navy should consist of 48 battleships, 22 armored cruisers, 64 scouts and numerous auxiliaries. Such a force is more than double our present one and would entail an annual budget of perhaps $250,000,000. Such a sum is out of the question, and popular as the navy is at present with the country at large, it is doubtful whether the yearly appropriation will reach such a sum for many years.

The number of the different classes of ships stated to be necessary in the article mentioned might be desirable if men and money were unlimited. But when we inquire into the cost of construction and maintenance of certain classes of ships, their desirability becomes most questionable, especially when we keep in mind the fact that we must obtain the greatest fighting value on a certain amount of money. We have in our service 10 armored cruisers that cost as much to construct, and more to maintain in service than any battleship at present in commission. We sold their birth right of guns for a paltry gain of a knot or so in speed. Would not many minds be easier if in place of these cruisers in the Pacific, we had there a fleet of the corresponding number of battleships. All of which could have been obtained without the slightest addition to past appropriations, had the navy declared itself for battleships. The day of the armored cruiser is past, but another dream of the naval strategist in the form of the "scout" has appeared to threaten the integrity of the Treasury. We have invested in three of these naval "necessities," and for the same money one first-class battleship could have been built. In the article above mentioned, 64 scouts are stated to be necessary.

64 scouts equal 21 battleships. Which are worth more in time of war?

When Sir John Fisher became First Lord of the Admiralty he began his regime by consigning scores of obsolete vessels to the scrap heap. This was done in the face of great opposition, but the wisdom of this step has since been universally recognized. The money necessary for their maintenance was diverted to vastly more useful purposes.

With this example to guide the way it should not be difficult to do the same in our own service. Let us look forward to the day when every vessel's name on the navy list represents a fighting unit.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ENDURANCE TESTS OF KRUPP NAVAL GUNS OF LARGE CALIBER.

Translated by PHILIP R. ALGER, Professor, U. S. Navy.

In recent years, there has been a general tendency to increase the caliber and power of naval and coast defence guns. At the same time, the fear becomes more and more manifest that guns of large caliber, on account of their increased power, may wear out prematurely and lose accuracy of fire to such an extent as to no longer meet the justifiable needs of service in times of peace and of war. Several examples of short life which have occurred in the naval and coast artillery of various countries seem to justify these fears. In view of such occurrences, it seems opportune to call attention to some endurance tests lately carried out by the Krupp Company at the Meppen firing ground with several of their large caliber guns of the jacketed and hooped type. The results of these trials furnish proof that, in so far as guns of the Krupp construction are concerned, the above mentioned apprehension is devoid of any foundation.

Two 8.27-inch naval guns, length 45 calibers, model 1901, and an 11.02-inch naval gun, length 45 calibers, model 1901, have, in the course of recent years, fired a very large number of rounds at the Meppen proving ground. Before each round, excepting in the series fired rapidly, the length of the powder space was determined by measuring the distance from the rear face of the loaded projectile to the supporting ring for the cartridge case bourrelet; since an excessive increase of the length of the chamber, due to wear and the erosion of the rifling lands at their origin, would entail a notable diminution of the initial velocity, and of the accuracy of fire, and consequently of fitness for service.

The indications indispensable for a judgment of durability, taken from the actual results of the tests referred to, are set forth in what follows, as well as in appendices 1 and 2. It is there shown that the two guns of 8.27-inch caliber have fired, up to the

present time, 390 and 344 rounds, respectively, and the 11.02-inch gun, 192 rounds, without the muzzle energy and accuracy of fire being sensibly diminished; the limit of their lives, therefore, has not yet been attained, and the tests of these guns will consequently be continued.

KRUPP 8.27" GUNS OF 45 CALIBERS LENGTH, NOS. 1 AND 2.

(Light type, Model 1901, with jacket and two rows of hoops.)

DATA RELATIVE TO GUN NO. 1.

Length of gun	370.9"
Length of bore	347.5"
Length of powder space	55.4"
Length of rifled bore	292.1"
No. of grooves	64
Twist of rifling	1 in 45 to 1 in 30 calibers
Weight of gun, with breech closure	33,369 pounds
Weight of projectile	238 pounds
Initial velocity	2,789 f. s.
Muzzle energy	12,850 f. t.

Gun No. 2 had a longer powder chamber (56.0-inch), on account of the reinforced rotating bands adopted for its greater power (mean initial velocity 2903 f. s., see also "Remarks" relative to Gun No. 2). The rifled part, consequently, is shortened to 291.4-inch. The number of grooves is reduced to 60.

REMARKS REGARDING THE EXTRACTS FROM FIRING SHEETS AND THE DIAGRAMS OF POINTS OF FALL OF 8.27-INCH GUN NO. 1.

With the principal object of these trials, which was the determination of durability, were combined certain secondary objects, particularly experimentation with powders of different dimensions as well as with rotating bands of different forms and materials. The variations in initial velocities, for equal weights of projectile and of charge, must be attributed to this circumstance as well as to the lower temperature of the powder in the latter tests.

After the first 350 rounds, the initial velocity was increased from 2789 f. s. to 3084 f. s. in order to try the gun also with the normal power (15,690 f. s.) for which Krupp guns of this caliber and model are designed. Under these conditions, 36 rounds were fired.

In judging the resistance of the gun, account must be taken of the higher temperature of combustion, in comparison with nitrocellulose powder, of the powder with 25 per cent of nitroglycerine used in all the tests. It must also be taken into consideration that

the greater part of the firings were concentrated in very short intervals of time. Among others, there were three rapid-fire series of ten rounds each, that is, rounds Nos. 231 to 240 in 2 minutes and 20 seconds, rounds Nos. 241 to 250 in 2 minutes and 25 seconds, and rounds Nos. 264 to 273 in 3 minutes and 3 seconds, which, on the average, corresponds to four rounds per minute.[1] In spite of all these conditions favoring wear and erosion of the lands, the length of the powder space only increased 2.52-inch, or less than ⅓ a caliber, as the result of the 392 rounds fired up to the present time. This shows how great the resistance of the gun is, in spite of its great power. How small, thanks to this great endurance, the loss of initial velocity attributable to increased length of the powder chamber has been, may be seen by comparing rounds 14, 18 and 22 with rounds 214, 220 and 226, as well as rounds 54, 60 and 66 with rounds 215, 221 and 227. These rounds furnish a particularly good comparison for the reason that they were fired with powder and projectiles of the same kind and of the same lot. Only the temperature of the powder differed much, being 14° C. in the latter firings, or 13° C. lower than in the earlier ones. The first of these comparisons, where the length of the powder chamber had increased by the small quantity of 1.14-inch after about 200 rounds, shows a diminution of average initial velocity of only 86 f. s., and the second, where the length of the powder chamber had increased .95-inch after about 160 rounds, shows a loss of velocity of 90 f. s. And, moreover, it must be noted here that the greater part of these diminutions of velocity—about 66 f. s.—is due to a lower temperature of powder.

At round No. 386 a projectile weighing 309 pounds and 4 calibers long was fired to determine if the gun was still capable of meeting the requirements imposed by the forcing of so long a projectile. The test was particularly hard from the fact that the projectile was taken from the old stock of the proving ground and for this reason the form of its rotating band was not suited either to the great initial velocity or to the special conditions of loading. The trajectory of the projectile, nevertheless, was excellent (see the illustration of the perforations made in cardboard screens, placed 50 meters and 140 meters from the muzzle).

[1] In the extracts from the firing sheets, in Appendix 1, rounds 231 to 237 and 238 to 250 are grouped in series, because the former were fired with shell fitted with less-pointed caps, and the latter with more-pointed caps.

The diagrams of points of fall were chosen so as to permit a comparison at three different ranges, at the beginning, at the middle, and near the end of the tests thus far carried out. It may be safely concluded from them that the accuracy of the gun has remained beyond criticism. This is also proved by the last grand series of rounds, fired after the increase of initial velocity (rounds Nos. 375 to 385 at about 13,500 yards, having given a dispersion in range of 126.6 yards, and a mean dispersion in direction of 12.3 yards), and by the rapid firings (rounds 264 to 273 at 7100 yards having given a mean dispersion in direction of only 4 yards).

REMARKS REGARDING THE EXTRACTS FROM FIRING SHEETS AND THE DIAGRAMS OF POINTS OF FALL OF 8.27-INCH GUN NO. 2.

Until shot No. 266, the charges were for the most part chosen to give an initial velocity averaging about 2903 f. s. and reaching as high as 3018 f. s. The increase of length of the powder space is consequently greater than in gun No. 1. The last 78 shots thus far fired, that is Nos. 267 to 344, were against armor plate, with charges and velocities reduced to give the desired velocity on impact.

On account of the constantly varying conditions of charges and projectiles, the initial velocities constitute, as a means of judging the durability of the guns, a less sure basis than in the case of gun No. 1; but very favorable testimony in this regard is given by the diagrams of points of fall contained in Appendix 2. On account of the less number of rounds, only two series of rounds at two different distances are here compared; besides this, the result of the last grand series of rounds is shown with the diagram of points of fall prior to the firing against armor plates (shots 234 to 247 at about 12,250 yards, having likewise given a very satisfactory accuracy). In a series of rounds fired still later (258 to 266 at about 8750 yards), the ranges were only estimated, on account of the marshy ground at the points of fall; the total dispersion in range was only about 164 yards.

SUPPLEMENT.

Subsequent to the foregoing the endurance test of 8.2-inch gun No. 2 was continued up to a total number of more than 500 rounds. The mean initial velocity obtained during this continuation of firing was 2952 f. s., the weight of projectile being always 238 pounds. The firing was almost exclusively for accuracy at a dis-

tance of about 8750 yards, and the results exceeded every expectation. The dispersions remained in an absolutely uniform manner of the same value as in the first part of the trials. Thus there was obtained:[2]

Rounds 392 to 402 at 8,573 yards;
L_{50} = 32.7 B_{50} = 6.9 yards.
Rounds 403 to 412 at 8,443 yards;
L_{50} = 54.5 B_{50} = 5.1 yards.
Rounds 453 to 462 at 8,520 yards;
L_{50} = 44.7 B_{50} = 5.6 yards.
Rounds 463 to 472 at 8,390 yards;
L_{50} = 70.2 B_{50} = 4.6 yards.
Rounds 483 to 492 at 8,257 yards;
L_{50} = 39.6 B_{50} = 7.5 yards.
Rounds 495 to 508 at 8,477 yards;
L_{50} = 33.1 B_{50} = 5.0 yards.

A comparison of the dispersion of the previous rounds, 212 to 227, with that of rounds 495 to 508, is especially instructive. The two diagrams are the results of firing with the same charge (82 rounds) and the same kind of powder; the temperature of the powder in the second case was 6° C. lower than in the first. Although about 300 rounds had in the meantime been fired, the rectangle of dispersion of the last series is only a little greater than that of the earlier one (166 against 153 square yards). To obtain the same range, it was necessary to increase the elevation about 1° in the last series.

THE KRUPP 11.02″ GUN, LENGTH 45 CALIBERS.

(Light gun, Model 1901, with jacket and two rows of rings.)

DATA.

Length of gun	501.4″
Length of bore	472.68″
Length of powder space	90.85″
Length of rifled bore	381.83″
No. of grooves	80
Rifling	1 in 45, to 1 in 30 calibers.
Weight of gun, with breech closure	82,914 pounds
Weight of projectile	672 pounds
Initial velocity	2,821 f. s.
Muzzle energy	37,113 f. t.

[2] See the diagrams of points of fall in Appendix 2. L_{50} and B_{50} are the length and width of the rectangle containing 50 per cent of the impacts. Half the sides of this rectangle are the "probable errors" in range and laterally. The "mean error," or "mean deviation" is the probable error divided by .845.

REMARKS RELATIVE TO THE EXTRACTS FROM THE FIRING SHEETS AND THE DIAGRAMS OF POINTS OF FALL.

Up to the end of 1907 there had been fired, with a mean initial velocity of 2821 f. s., 138 rounds, of which 28, towards the end of the trials thus far carried out, had a mean initial velocity as high as 2886 f. s. Besides these 138 rounds there were 33 fired with initial velocity of 2690 f. s., and 21 with a velocity below 2624 f. s. The firings until then carried out with this gun had for an object, in the first place, experiments with powders; the determination of the life of the gun was only a secondary consideration. Not only were the weights of charge and the temperature of the powder very different, but the powders used were also of very varying dimensions and compositions. In about half, the tubular powder contained 15 per cent of nitroglycerine and in the other half 25 per cent. For these reasons the initial velocities given in the extracts from the firing sheets do not offer direct evidence bearing upon the question of the durability of the gun; but we may conclude that it has a very great longevity, in view of the excellent conservation of the accuracy of fire, especially as regards the dispersion in range, as may be seen from the diagrams of points of fall in Appendix 2. The increase of only about $\frac{1}{3}$ of a caliber in the length of the powder space for 192 rounds speaks equally in favor of the gun's endurance.

APPENDIX I.

ENDURANCE TESTS

OF

KRUPP NAVAL GUNS

OF

8.27-INCH AND 11.02-INCH CALIBER.

(L/45 Mod. 1901)

AT MEPPEN.

(Extracts from the firing sheets.)

Rounds, numbered.	Range. Yds.	Elevation.	Weight of charge. Lbs.	Projectile.	Length of powder space.*	Initial velocity. f.s.
				8.27-in. Gun L/		**odel 19**
7—10	5368	2°30′	69.3	Shell L/3.1 cal., 238 lbs.		2779$^{+16}_{-18}$
14, 18, 22[3])	4906	2°7′.5	"	"		2860$^{\pm 3}$
54, 60, 66[3])	4461	1°52′.5	"	"		2835$^{+21}_{-20}$
91—110	15905	20°	"	"		(2723)
131—137	11353	10°	"	"		(2740)
176—180	7533	4°45′	70.8	Solid shot L/2.7 cal., 238 lbs.		2770$^{\pm 37}$
214, 220,[3]) 226	—	—	69.3	Shell L/3.1 cal., 238 lbs.		2774$^{+13}_{-14}$
215, 221,[3]) 227	—	—	"	"		2745$^{+24}_{-22}$
231—237	5990	4°	"	"		..... Ra
238—250	6909	4°	"	"		
256—263	16074	20°	73.0	"		(2805)
264—273	7070	4°	"	"		..... Ra
276—283	11928	11°	"	"		(2805)
318—328	16072	20°	"	"		(2822)
329—339	11904	11°	"	"		(2822)
340—350	7487	4°30′	"	"		2823$^{+5}_{-6}$
365—368	16385	16°45′	83.6	"		(3107)
375—385	13448	11°	"	"		(3104)
386[4])	3309	1°30′	"	Shell L/4 cal., 308.5 lbs.		2568
387—390	4269	"	"	Shell L/3.1 cal., 238 lbs.		3094^{+}

* The length of the powder space given for a series of rounds is the mean of the lengths measured in each round of the series. Where the length is not stated, it either was not measured, as in the case of the firings, or it was altered by the use of projectiles with experimental form of rotating band.

† This length was the measurement after the last round.

‡ Figur calculated

§ One

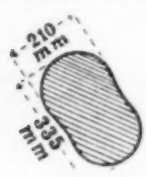
Initial velocity.‡	Maximum pressure.	50% rectangle		Wt. of a cu. meter of the air.§	Wind.	
		in range.	in direction.		Velocity.	Direction.
f. s.	Tons per sq. in.	Yds.	Yds.		f. s.	
Model 1901 (light) No. 1.						
2779^{+16}_{-18}	$21.1^{+.6}_{-1.0}$	92.5	3.5	1.169	12	
$2800^{\pm 3}$	$21.4^{+.4}_{-1.0}$	10.4	1.6	1.189	15	
2835^{+21}_{-20}	$21.2^{+.8}_{-.7}$	86.8	4.3	1.199	17	
(2723)	$18.9^{\pm 1.1}$	120.6	19.7	1.210	15	
(2740)	$18.9^{+.8}_{-.9}$	104.9	11.0	1.229	11	
$2770^{\pm 37}$	$19.8^{+.9}_{-1.1}$	81.0	5.1	1.260	14	
2774^{+13}_{-14}	$19.1^{+.5}_{-.3}$	—	—	1.253	6	
2745^{+24}_{-49}	$18.9^{+1.1}_{-.8}$	—	—	1.253	6	
..... Rapid-fire.....		116.1	6.1	1.256	6	
		296.8	4.3	1.256	6	
(2805)	—	73.3	7.5	1.286	7	
..... Rapid-fire.....		110.7	4.1	1.286	7	
(2805)	—	51.8	13.4	1.286	7	
(2822)	—	139.8	9.4	1.283	12	
(2822)	—	73.0	6.1	1.283	12	
2823^{+5}_{-6}	$19.2^{+.3}_{-.2}$	56.2	8.3	1.288	12	
(3107)	$25.1^{\pm .3}$	114.8	33.4	1.297	6	
(3104)	$24.6^{+.8}_{-1.4}$	126.8	12.4	1.297	6	
2568	20.3	—	—	1.297	5	
3094^{+10}_{-9}	$24.3^{\pm .3}$	92.0	6.5	1.297	5	

‡Figures not enclosed in brackets are the results of special measurements of velocities; those in brackets are calculated from the results of other firings under approximately the same conditions.

§One cubic meter of standard air weighs 1.206 kilograms.

Rounds, numbered.	Range. Yds.	Elevation.	Weight of charge. Lbs.	Projectile.
				8.27-in. Gun L
5	5351	2°7′.5	77.0	Shell L/3.1 cal., 238 lbs.
34—50	8195	4°45′	78.1	"
51—54	about 8311	5°	"	"
55—57	"	5°	"	"
58—61	"	5°	"	"
96—125	15581	18°	"	"
201—205	16601	19°	81.8	"
212—227	8662	5°	"	"
234—247	12277	10°	83.2	"
257	4429	1°52′.5	"	"
258—266	about 8683	4°52′.5	84.7	Shell L/2.8 cal., 238 lbs.
				11.02-in. Gun L
9—13	9287	5°	209.4	A. P. Shell, loaded with high explosive, L/3.2 cal., 672 lbs.
14—16	12310	7°30′	216.0	
19—23	3976	1°30′	"	
77—81	4400	1°37′.5	235.8	
151—155	5037	2°	224.8	
171—176	9930	5°	233.6	
180—184	12702	7°30′	"	

FORM OF HOLES MADE IN SCREENS BY ROUND NO. 386.



First screen
50 m. from muzzle.

Second screen
140 m. from muzzle.

The form and inclination of the ... show that the axis of the projectile ... sensibly closer to the tangent to the ... than it was at the first screen. That is, ... bility has lessened. (See end of Remarks ... to 8.27-in. gun No. 1.)

Initial velocity.‡ f. s.	Maximum pressure. Tons per sq. in.	50% rectangle in range. Yds.	50% rectangle in direction. Yds.	Wt. of a cu. meter of the air.§	Wind. Velocity. f. s.	Wind. Direction.
Model 1901 (light) No. 2.						
2996	25.3	—	—	1.256	18	
2998^{+7}_{-14}	$20.7^{+.3}_{-.4}$	62.5	10.0	1.251	18	
3009^{+10}_{-9}	$22.6^{+.8}_{-.3}$	—	—	1.250	12	
3010^{+19}_{-9}	$22.8^{+.9}_{-.7}$	—	—	1.250	12	
3009^{+14}_{-15}	$23.5^{+1.0}_{-.8}$	—	—	1.250	12	
(2871)	$20.8^{+.5}_{-.9}$	94.6	14.7	1.254	9	
(2930)	—	68.4	11.5	1.229	8	
(2920)	$20.1^{+.7}_{-1.1}$	70.0	2.2	1.211	7	
(2933)	$20.3^{+.5}_{-.8}$	74.0	9.3	1.219	10	
(2902)	20.6	—	—	1.215	6	
(2953)	$20.8^{+1.0}_{-.4}$	—	—	1.215	6	
Model 1901 (light).						
2764^{+13}_{-14}	$19.6^{+.6}_{-.3}$	71.3	6.9	1.283	3	
(2788)	$20.3^{+.6}_{-.7}$	24.2	1.3	1.289	5	
2789^{+29}	$19.4^{+.4}_{-.5}$	55.5	1.3	1.289	5	
2865^{+8}_{-10}	$20.3^{+.7}_{-.6}$	22.6	2.1	1.271	20	
2795^{+14}_{-9}	$19.9^{+.6}$	33.8	3.0	1.234	8	
2903^{+14}_{-18}	$22.6^{+.3}_{-.5}$	66.8	6.7	1.222	17	
2857	$22.1^{+.1}_{-.5}$	21.1	8.6	1.222	17	

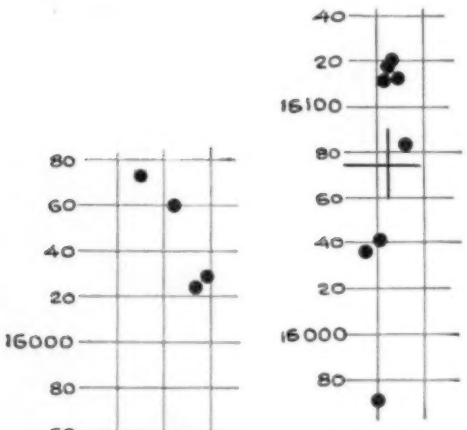
See footnotes on preceding pages.

APPENDIX II.

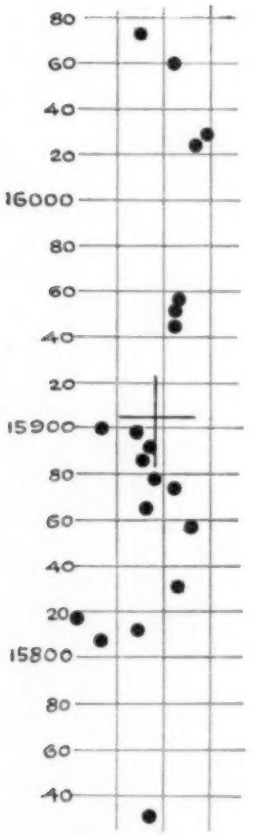
POINTS OF FALL.

RANGES AND SIDES OF 50% RECTANGLE IN YARDS.

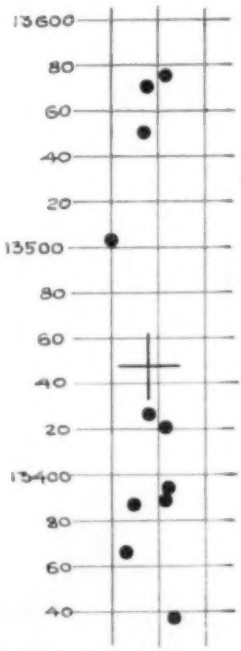
8.27-INCH GUN, NO. 1



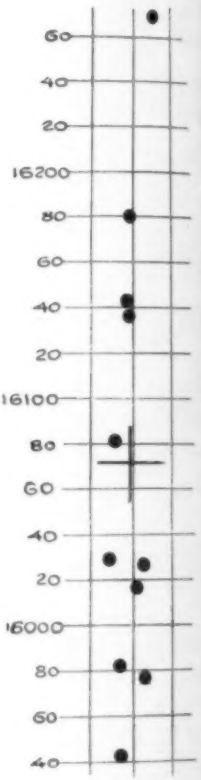
Shots 256-263
$L_{50} = 73.3$ $B_{50} = 7.5$



Shots 91-110
$L_{50} = 120.6$ $B_{50} = 19.7$

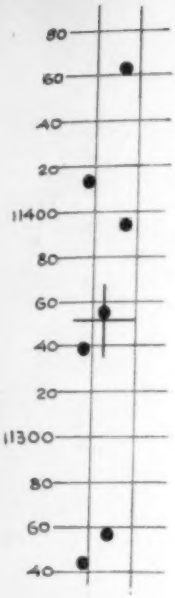


Shots 375-385
$L_{50} = 126.8$ $B_{50} = 12.4$

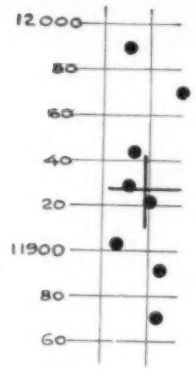


Shots 318-328
$L_{50} = 139.8$ $B_{50} = 9.4$

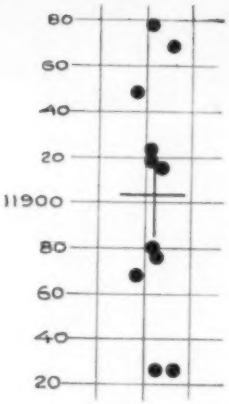
8.27-INCH GUN, No. 1

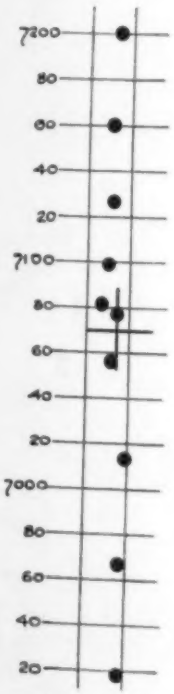


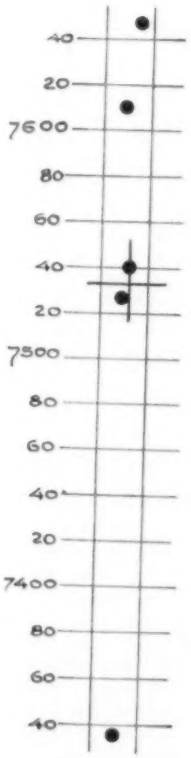
Shots 131-137
$L_{50} = 104.9$ $B_{50} = 11.0$



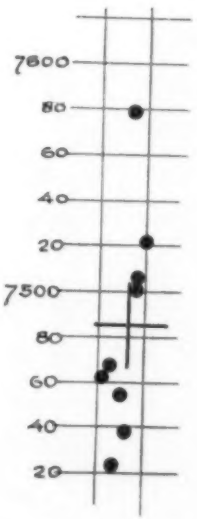
Shots 276-283
$L_{50} = 51.8$ $B_{50} = 13.4$



Shots 329-339
$L_{50} = 73.0$ $B_{50} = 6.0$

Shots 176-180
$L_{50} = 81.0$ $B_{50} = 5.1$

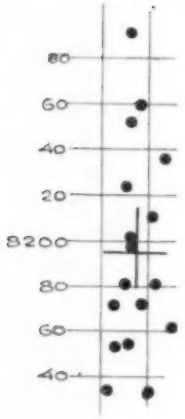


Shots 264-273
$L_{50} = 110.7$ $B_{50} = 4.1$

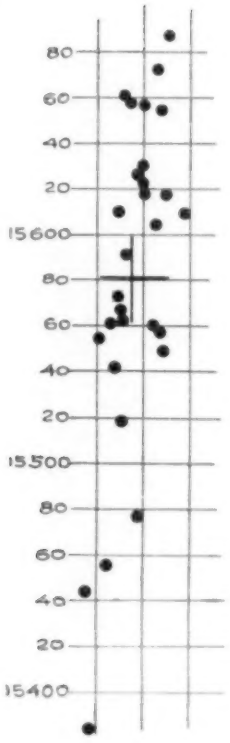


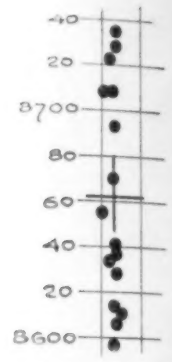
Shots 340-350
$L_{50} = 56.2$ $B_{50} = 8.3$

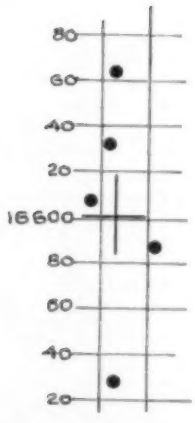
8.27-INCH GUN, NO. 2

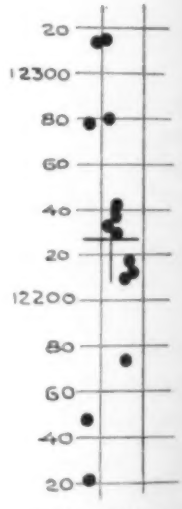


Shots 34-50
$L_{50} = 62.5$ $B_{50} = 10.0$

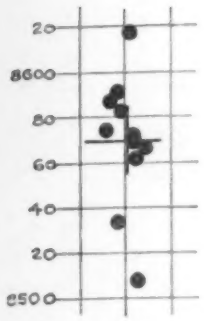


Shots 96-125
$L_{50} = 94.6$ $B_{50} = 14.7$

Shots 212-227
$L_{50} = 70.0$ $B_{50} = 2.2$

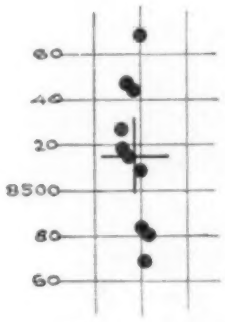


Shots 201-205
$L_{50} = 68.4$ $B_{50} = 11.5$

Shots 234-247
$L_{50} = 74.0$ $B_{50} = 9.3$

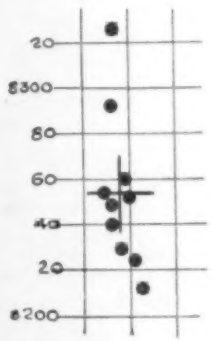
8.27-INCH GUN, NO. 2



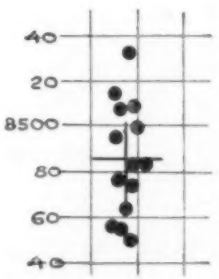
Shots 392-402
$L_{50} = 32.7$ $B_{50} = 6.9$



Shots 453-462
$L_{50} = 44.7$ $B_{50} = 5.6$

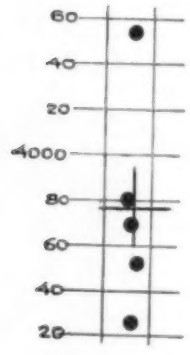


Shots 483-492
$L_{50} = 39.6$ $B_{50} = 7.5$

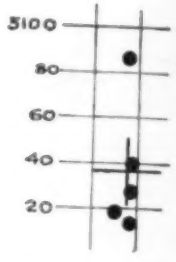


Shots 495-508
$L_{50} = 33.1$ $B_{50} = 5.0$

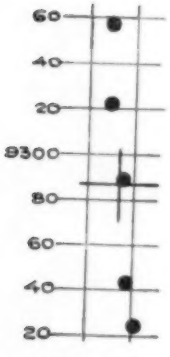
11.02-INCH GUN



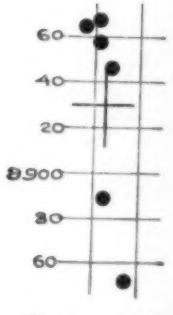
Shots 19-23
$L_{50} = 55.5$ $B_{50} = 1.3$



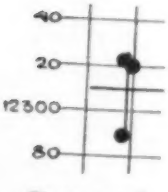
Shots 151-155
$L_{50} = 33.8$ $B_{50} = 3.0$



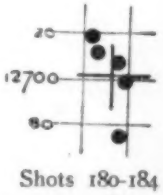
Shots 9-13
$L_{50} = 71.3$ $B_{50} = 6.9$



Shots 171-176
$L_{50} = 66.8$ $B_{50} = 6.7$



Shots 14-16
$L_{50} = 24.2$ $B_{50} = 1.3$



Shots 180-184
$L_{50} = 21.1$ $B_{50} = 8.6$

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

COMPENSATION OF THE COMPASS AND DETERMINATION OF THE DEVIATION WITHOUT THE USE OF OBSERVED AZIMUTHS.

By First Lieutenant Radler de Aquino, Brazilian Navy.

Reprint from the *Revista Maritima Braziliera*, No. 12, 1903.

Translated from the Portuguese by
Commander L. H. Chandler, U. S. Navy.

1909.

[Translator's Note.—I have ventured to make this translation and to present it to the members of the Naval Institute, because it is the only full description I have been able to find of this method of compensation, a method which certainly possesses sufficient advantages to repay the study necessary to enable it to be used when circumstances prevent a reliance upon our ordinary methods. In reading it must always be remembered that the author is describing the methods employed in the use of Lord Kelvin's compass, binnacle and accessories, which methods would necessarily be somewhat modified with our apparatus, although our binnacle, with its magnet tray or racks, affords excellent facilities for the use of the author's special methods. This translation is published with the permission of the author, Lieutenant Radler de Aquino, Brazilian Navy, who also kindly consented to revise the manuscript before it was sent to the printer.]

I. Why Employ Special Deflectors?

"The deflector is an instrument by means of which the deviation of the compass may be determined and the compass accurately compensated at any time, independently of the sun and regardless of overcast skies, fog or darkness. It makes use of the principle that, by means of a magnet which attracts or repels the north end of the compass needle, the exact strength of the proper correctors may be determined." (Gareis: "Uber Deflectoren," *Mittheilungen aus dem Gebiete des Seewesens*, Pola, Vol. XXV, No. 1, 1897, p. 10.)

In the year 1846, an English general, Sir Edward Sabine, in a little pamphlet[1] explained the use of his "deflecting apparatus,"

[1] *Philosophical Transactions of the Royal Society*, London, 1846, p. 347; "Directions for the Use of a Small Apparatus to be Employed with the Standard Compass of a Ship," London, 1849 and 1856.

showing the possibility of determining the directive force of the compass needle on any heading of the ship, and also how to find, independently of observed bearings, the values of the two terms which when combined represent the semicircular deviation.

In 1862, Lieutenant Raphael, of the French Navy, again took up the problem, but without practical results.

Still later, the French admiral, Ernest Fournier, then a lieutenant, constructed an apparatus similar to that of Sabine, which he called an "alidade of deviation," and demonstrated the possibility of obtaining by its use the separate values of B' and C, the exact coefficients of the terms involving semicircular deviation, and also the exact coefficient, D', of the term involving the major part of the quadrantal deviation.[2]

In 1878, Lord Kelvin, then Sir William Thomson, presented an explanation of the principle and use of his "adjustable deflector," by means of which it is possible to effect the horizontal compensation of the compass, and, if desired, to determine the deviation.[3]

Since that date, various instruments called "deflectors" have appeared, all based on the same theoretical principles. The inventors of these were Lieutenant Collongue, of the Russian Navy; Lieutenant Clausen, of the Danish Navy; A. Gareis, the well-known director of the hydrographic department of Austria; and Heinrich Florian, the eminent nautical expert of the Adria Society of Steam Navigation.[4]

In foggy weather, at sea or in port, it was formerly impossible to regulate the compass, until Poisson's theory, as modified by Archibald Smith, demonstrated that the deviation on each heading

[2] "Déviations des Compas: Exposé théorique et pratique d'une méthode nouvelle pour déterminer rapidement, à la mer, dans toutes les circonstances de la navigation, les déviations de l'aiguille aimantée du compas étalon," Paris, 1873.

[3] *Journal of the Royal United Service Institution*, London, Vol. XXII, 1879, p. 103.

[4] "Die Compassregulierung bei Nacht und Nebel," *Mittheilungen de Pola*, Novembro, 1897, Vol. XXV, No. 11, p 827. Also the solutions presented by Lieutenant Aymes, of the French Navy, by means of his "magnetic balance"; by the hydrographic engineer Caspari, with his "vibrating card"; by the French constructor Démichel, with his "deflector," similar to those of Gareis and Florian; by Captain Jacquemier, with his "magnetometer"; and by many others who have devoted themselves to the practical solution of this problem.

depended upon five coefficients, which coefficients could not only be obtained from the values of observed deviations, but also directly from the directive forces which control the compass on the different headings.[5]

In a previous paper[6] (by the author of this one), Poisson's theory was presented, as aptly modified by Smith, and his formulæ were expressed as functions of certain parameters expressing the effect upon the compass of iron on board ship, which gave for the deviation formula:

$$\tan \delta = \frac{A' + B' \sin z + C' \cos z + D' \sin 2z + E' \cos 2z}{1 + B' \cos z - C' \sin z + D' \cos 2z - E' \sin 2z}, \quad (1)$$

and also

$$\sin \delta = A' \cos \delta + B' \sin z' + C' \cos z' + D' \sin (2z' + \delta) + E' \cos (2z' + \delta), \quad (2)$$

in which

$$\lambda A' = \frac{d-b}{2}, \quad (3)$$

$$\lambda B' H = P + cZ, \quad (4)$$

$$\lambda C' H = Q + fZ, \quad (5)$$

$$\lambda D' = \frac{a-e}{2}, \quad (6)$$

$$\lambda E' = \frac{d+b}{2}, \quad (7)$$

$$\lambda = 1 + \frac{a+e}{2}. \quad (8)$$

The above formulæ show that the deviation of a compass is a function of the exact coefficients A', B', C', D' and E' (in themselves functions of λ), and that it is extinguished when they disappear from the equation.

Before passing on from this final result, let us turn back to the expressions for the forces which deflect the compass from the plane of the magnetic meridian, which are

$$H' \cos z' = \lambda H (\cos z + A' \sin z + B' + D' \cos z - E' \sin z), \quad (9)$$

$$-H' \sin z' = \lambda H (-\sin z + A' \cos z + C' + D' \sin z + E' \cos z), \quad (10)$$

in accordance with the accepted notation.

[5] Collet: "Traité théorique et pratique de la Régulation et de la Compensation des Compas," Paris, 1886, p. 241.

[6] Aquino: "Estudo theorico e pratico dos Instrumentos Nauticos de Lord Kelvin," "Magnetismo dos Navios," etc., Rio de Janeiro, 1902.

$H' \cos z'$ represents that component of the total directive force acting on the needle, H', which acts to draw the north point of the needle to the bow, while $H' \sin z'$ represents the component of the same total force which acts to starboard.

As $z = z' + \delta$ (that is, the magnetic heading, z, differs from the compass heading, z', by the deviation, δ), we have

$$H' \cos z' = \lambda H [\cos(z'+\delta) + A' \sin(z'+\delta) + B' + D' \cos(z'+\delta) - E' \sin(z'+\delta)], \quad (11)$$

$$-H' \sin z' = \lambda H [-\sin(z'+\delta) + A' \cos(z'+\delta) + C' + D' \sin(z'+\delta) + E' \cos(z'+\delta)]. \quad (12)$$

As we know, the coefficients A' and E' in the above formulæ are the result of unsymmetrical soft iron represented by the paramaters b and d. In actual practice, as the standard compass is placed in the plane of symmetry, these two coefficients can be considered as non-existent.

The formulæ then reduce to

$$H' \cos z' = \lambda H (1 + D') \cos(z'+\delta) + \lambda H B' \text{ to head,} \quad (13)$$

$$H' \sin z' = \lambda H (1 - D') \sin(z'+\delta) - \lambda H C' \text{ to starboard.} \quad (14)$$

The form in which D' and B' appear in the above equations proves that the parameters a, e, c and P act to deflect the needle to head; and in which D and C appear, that a, e and Q (for $f = 0$, from symmetry) act to deflect it to starboard.

The general formula for the deviation also reduces to

$$\tan \delta = \frac{B' \sin z + C' \cos z + D' \sin 2z}{1 + B' \cos z - C' \sin z + D' \cos 2z} \quad (15)$$

and

$$\sin \delta = B' \sin z' + C' \cos z' + D' \sin(2z' + \delta). \quad (16)$$

The relation between the magnetic and compass headings, as taken from the above formulæ, is

$$\tan z' = \frac{(1 - D') \sin z - C'}{(1 + D') \cos z + B'}$$

THEOREM.—*When the horizontal magnetic forces on four equidistant headings are equal, the coefficients B', C' and D' will be zero, and there will be no deviation.*[1]

[1] In order that the coefficient E' may be considered as zero, the directive force on one more heading must be equal to the directive force on the four other headings; that is, the directive force must be equal on five headings in order to have $B' = C' = D' = E' = 0$.

For greater simplicity, in practice we take as the equidistant headings the four cardinal points, N., E., S. and W., for which we have $z'=0°$, $90°$, $180°$ and $270°$ respectively.

When the heading is N. or S. by compass, we have from formula (13)

$$H_n'=\lambda H(1+D')\cos\delta_n+\lambda HB' \text{ to head,} \tag{17}$$

$$H_s'=\lambda H(1+D')\cos\delta_s-\lambda HB' \text{ to head.} \tag{18}$$

When the heading is E. or W. by compass, we have from formula (14)

$$H_e'=\lambda H(1-D')\cos\delta_e-\lambda HC' \text{ to starboard,} \tag{19}$$

$$H_w'=\lambda H(1-D')\cos\delta_w+\lambda HC' \text{ to starboard.} \tag{20}$$

Owing to the symmetrical disposition of the iron on board ship:

$$\delta_n=-\delta_s. \tag{21}$$

$$\delta_e=-\delta_w. \tag{22}$$

If we suppose δ to be not greater than one point ($11°\ 15'$), we may consider $\cos\delta=1$ (actually $\cos 11°\ 15'=0.98$), and we can add and get

$$H_n'+H_s'+H_e'+H_w'=4\lambda H. \tag{23}$$

From the same formulæ we have

$$\frac{H_n'-H_s'}{\frac{1}{2}(H_n'+H_s'+H_e'+H_w')}=\frac{2\lambda HB'}{2\lambda H}=B', \tag{24}$$

$$\frac{H_w'-H_e'}{\frac{1}{2}(H_n'+H_s'+H_e'+H_w')}=\frac{2\lambda HC'}{2\lambda H}=C', \tag{25}$$

$$\frac{(H_n'+H_s')-(H_e'+H_w')}{(H_n'+H_s'+H_e'+H_w')}=\frac{4\lambda HD'}{4\lambda H}=D'. \tag{26}$$

The approximate formula for the deviation is

$$\delta=B\sin z'+C\cos z'+D\sin 2z', \tag{27}$$

in which

$$B=B'\left(1-\frac{D'}{2}\right), \tag{28}$$

$$C=C'\left(1+\frac{D'}{2}\right), \tag{29}$$

$$D=D'.^{*} \tag{30}$$

* *Admiralty Manual for the Deviation of the Compass*, London, 1901, p. 115. As B, C, and D are expressed in degrees, it is necessary to multiply the coefficients B', C' and D' by 57.3° (the number of degrees contained in an arc equal in length to the radius), or to transform the sine of the arc by means of the table of natural sines.

Admitting the hypothesis that

$$H_n' = H_s' = H_e' = H_w'. \tag{31}$$

we see clearly that

$$B' = C' = D' = 0, \tag{32}$$

which is what we sought to prove.

The above demonstration is all that is necessary to enable us to clearly understand the methods of compensation and for determining the exact and approximate coefficients (and from them the deviations) by the use of the instrument for measuring the horizontal forces, that is to say, by the employment of the "deflector."

The introduction of the new practical methods explained later renders unnecessary the use of the special deflectors with the Thomson compass and others, and facilitates greatly all of the operations necessary for the solution of this important problem.

II. DEFLECTORS IN GENERAL.

As says Gareis: "The deflector, in principle, is a magnet, or magnets, by the use of which the compass may be deflected while the ship is on the various headings, from the resulting observations of which process we can measure the directive force on each heading," which is the desired result.

Diagrammatically, from O, the center of the compass rose (Fig. 1), the line ON is drawn in the direction of the directive force of the needle, the distance ON representing, on some convenient scale, the horizontal force of the earth, H. From O, draw OA in the direction of the magnetic axis of the deflector, and lay off the distance $OM = K$ to scale, equal to its magnetic moment.

Under the influence of the deflector the compass needle will be deflected from the meridian, ON, to a new direction, say ON', forming an angle β with its original direction ON.

Let us express the angle $N'OA$ by the character α. Then we see from the figure that

$$K \sin \alpha = H \sin \beta. \tag{33}$$

When the magnetic axis of the deflector is perpendicular to the direction of the deflected needle, ON', then the angle $\alpha = 90^\circ$, and $\sin \alpha = 1$; and in this case from (33) the magnetic force of the deflector will be proportional to the sine of the deflection

which it causes. Therefore such a procedure is called the method of sines, which method was first elucidated by the eminent French physicist Pouillet, as a means for measuring the force of electric currents by means of the sine galvanometer.

If $\alpha=\beta=90°$, we have $K=H$, in which case the horizontal magnetic force of the earth is equal to the force of the deflector.

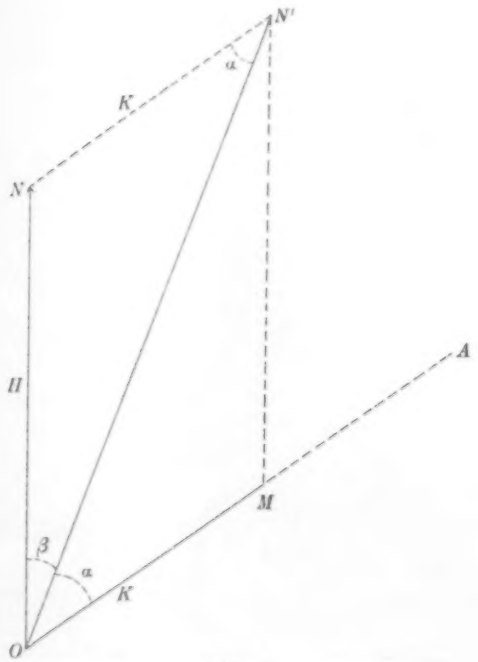


FIG. 1.

When the magnetic axis of the deflector is perpendicular to the original direction of the needle, ON, we will have $\alpha+\beta=90°$, whence $K=H\tan\beta$, in which case the force of the deflector will be proportional to the tangent of the deflection which it causes. This method is called the tangent method, and is the basic principle of the tangent galvanometer employed in measuring electric currents.

If $\beta=45°$, we will have $K=H$, which is to say that the magnetic force of the deflector is equal to the horizontal force which attracts the needle.

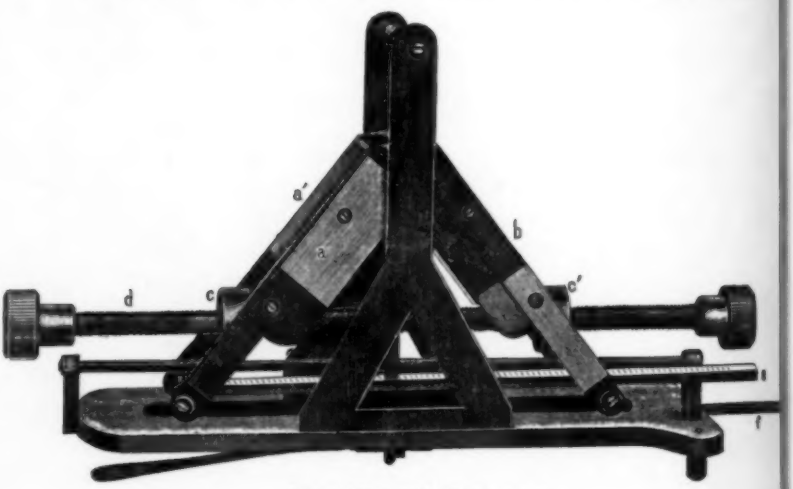
Lord Kelvin's deflector, the description of which and the rules

for the use of which follow, and that of Clausen (his first instrument) employ the first principle, that of sines. On the contrary, those of Gareis, Clausen (his later instrument) and Florian use a special method which is a modification of the tangent method, and which is due to Lieutenant Clausen, which principle, because of its superiority over the method of sines, also serves as the basis of the new practical method to be described later in this paper.

Any deflector can be used with any of the methods explained, but it is thought that Clausen's method is the best.

III. LORD KELVIN'S DEFLECTOR.

COMPENSATION AND DETERMINATION OF THE COEFFICIENTS.



LORD KELVIN'S DEFLECTOR.
(Natural size.)

Description and Manipulation.—As clearly shown in the plate,[1] the new model of Lord Kelvin's deflector (which differs only slightly from the old one) is composed of a frame to which are attached two pairs of magnets, a, a' b and b' (b' not visible in the plate). Each pair stands in the form of an inverted V, and is so arranged that it is possible to increase or decrease the angular

[1] There is a type of deflector later than the one shown in the plate and described here, but it is thought that it is not materially better than this one.

opening between the two legs of the pair by turning the screwed spindle *dcc'*, which is also secured to the frame. The horizontal axis, by swinging which we rotate the frame, is mortised into the vertical columns.

The angular opening between the two pairs of magnets (which are cross-connected), is recorded on a scale, *e*, graduated in millimeters. The decimals of a millimeter are recorded on the head of the screw shaft which opens and closes the magnets. When the angle of opening between the magnets is zero, the scale also reads zero.

The whole apparatus is mounted upon a horizontal metal frame similar to the alidade of a prismatic azimuth instrument, and is placed in a similar manner upon the top of the compass bowl, being centered by two points on the under side at the right-hand end of the spring which is shown on the plate at the left-hand end of the instrument. The pointer, *f*, indicates the direction of the magnetic axis of the deflector.

When the reading of the scale is zero, the red ends of *a* and *a'* are very close to the blue ends of *b* and *b'*, respectively, and the magnetic moment of the system will be very small, as it is a function of the distance between these opposite poles. With deflector No. 270, aboard the cruiser *Barroso*, the deflector, when the scale reads zero, produces only 4.2° deflection of the standard compass (a Kelvin compass).

As the screw is turned, the poles of the magnets separate, and the magnetic moment of the system is increased in proportion to the increase in the reading of the scale.

The same deflector, No. 270, with the same compass, aboard the *Barroso*, at Rio de Janeiro, on October 2, 1900, for a scale reading of 16.5, produced a force equal to the horizontal force of the earth at that place; viz., 0.250 C. G. S.

The method of using Lord Kelvin's deflector is simple. Suppose that we are to do the work both on shore and afloat, in the same locality, and that the horizontal force on board which attracts the needle is H'. By the method of sines we see that it is possible to measure this force by means of the deflector by creating with it a deflection, called the "normal deflection," in which the angle β created is 90°, when the "angle of position," or α, is also 90°. In this case $K = H'$. Then the deflector will give immediately the value of H', by setting the deflector to the reading

of the scale corresponding to the magnetic moment of the instrument necessary to produce a force equal and opposite to H', by which the equilibrium of the needle is established at 90° from its original position.

In practice it is advisable to make $\beta = 85°$ and $\alpha = 78°\ 45'$, in view of the fact that the directive force will be zero when $\alpha = \beta = 90°$, on the assumption that the original heading is N., or 0°, and that we desire to know the reading of the deflector corresponding to the force H_n', which attracts the north end of the compass needle. Turn the screw of the deflector to separate or bring together the magnets, and swing the deflector in azimuth, to the right, let us suppose, until we deflect the compass 85° (that is, until it shows a heading of the ship of N. 85° W.), with the pointer of the deflector over the reading of N. 78° 45′ E. of the deflected card. Proceed in a similar manner on each of the other headings. If the reading of the deflector scale be 10.5, we know at once that:

$$K = \text{some function of } H' \text{ proportional to } 10.5. \qquad (34)$$

To quickly establish the equilibrium between the horizontal magnetic force of the deflector and the horizontal terrestrial force, it is necessary that the compass card should not swing rapidly when the deflector is moved. It is best to start with the pointer of the deflector over the north point of the compass, in which position no deflection is produced. Then swing it quickly to the position over N. 78° 45′ E. of the rose. Practice is necessary in order to enable the operator to establish the equilibrium of the card without loss of time. To place the deflector on top of or remove it from the compass bowl, it should be raised or lowered vertically, with its magnetic axis parallel to the compass needle, in order not to disturb the card and set up oscillations.

To effect the horizontal compensation by means of this instrument and to determine the approximate coefficients of the equation of deviation, it is not necessary to know the absolute values of the horizontal magnetic forces corresponding to the readings of the deflector scale, as the work may be readily done as follows:

GRADUATION OF DEFLECTOR (LORD KELVIN'S) No. 270.

COMPASS No. 9556.

Carry the deflector and the compass ashore to some place free from local magnetic forces, and where the horizontal magnetic force of the earth is known.

Set up the bowl horizontally, with the lubber's point coincident with the north point of the card. Set the scale of the deflector at zero, and place the instrument in its place on top of the bowl. Then observe the deflection, β, when the angle of position is $90°+\beta$; that is, when the pointer is at E. or W. by the deflected compass. Make the same observations for different readings of the scale (generally for differences of reading of two millimeters will be enough), and also observe accurately the reading of the scale for a deflection of 90°, under which conditions the terrestrial horizontal force is equal to that of the deflector. For readings for which the deflection is greater than 90°, it is necessary to observe also the point of the compass rose over which the pointer rests. For accuracy, these observations should be carried to the end of the scale. Then we may calculate the forces in the customary way by the use of the preceding formulæ.

As an example, we have observations made on October 2, 1900, on Fiscal Island, Rio de Janeiro, as set forth in the following table. If the curve for such a set of observations be plotted, it will point out any errors in one or more individual observations.

Sensibility of the compass..... 0.1°
Temperature ..... 23° C.
Plane of needle below point of suspension of card..... 0.027 m.

Reading of the scale.	Observed deflections.	Force of the deflector. $H=1$.
0	4.2	0.0727
2	10.9	0.1894
4	17.8	0.3062
6	24.9	0.4200
8	32.6	0.5398
10	41.1	0.6583
12	50.8	0.7753
14	62.2	0.8843
16	81.1	0.9881
16.5	90.0	1.0000
	Pointer at	
18	66.5	1.0900
20	57.0	1.1920
22	51.0	1.2870

Proceed to compensate the Thomson compass with this deflector, by the use of the compensating magnets and the soft-iron spheres, in the following manner:

Put the ship on compass heading north, by the compass that is

to be compensated, and make a comparison with another compass, to enable the ship to be steered by the latter during the operation. By means of the deflector, as already explained, deflect the compass normally, to either the right or left hand, to the known graduation of the scale which corresponds to a force equivalent to that which attracts the needle when heading north. This will be t, which we will express for convenience

$$H_n' = t_n. \tag{35}$$

Thus the deflector has turned the rose to the primitive position of equilibrium, which is north. Remove the deflector vertically, and proceed as follows:

Place the ship on headings E. and S. by the compass that is to be compensated, and take a comparison with the other compass on each to enable these courses also to be steered during the operation. Deflect the compass normally, and write similarly to the above:

$$H_e' = t_e, \tag{36}$$

$$H_s' = t_s. \tag{37}$$

If $H_s' = H_n'$, there is no necessity for fore and aft compensation, for, by the formulæ, in this case $B' = 0$. If they be different, set the scale of the deflector to the mean reading, $\frac{t_n + t_s}{2}$, and by means of the fore and aft magnets bring the deflection to normal. *Place the blue ends of the magnets in the direction towards which it is necessary to draw the north end of the compass needle.*

Repeat this operation with the ship heading E. by compass, and then on heading W., and we will have

$$H_w' = t_w. \tag{38}$$

If the readings corresponding to H_e' and H_w' are the same, there is no need for thwartships compensation, for the formulæ show that in that case $C' = 0$. If they differ, set the scale of the deflector to the mean reading, $\frac{t_e + t_w}{2}$, and place the thwartships magnets to obtain the normal deflection. *Place the blue ends of the magnets in the direction towards which it is necessary to draw the north end of the compass needle.*

Finally, if $H_n' + H_s' = H_e' + H_w'$ (that is, if $t_n + t_s = t_e + t_w$), from the formulæ it follows that $D' = 0$, and the quadrantal de-

viation is already compensated. If this be not true, set the deflector to the scale reading of $\frac{t_n+t_s+t_e+t_w}{4}$, and, with the ship heading either E. or W., set the spheres to produce the normal deflection when $t_n+t_s>t_e+t_w$, or to remove it when $t_n+t_s<t_e+t_w$.

When the compensation is carefully made by this method, it rarely leaves a residual deviation of over 2°.

We now present two examples to show the practical compensation and the determination of the approximate coefficients by the use of Lord Kelvin's deflector.

1. For the four headings indicated in the preceding work,[10] $H_n'=36.5$, $H_s'=15.2$, $H_e'=32.7$, $H_w'=16.9$:

$H_n'=36.5$	$H_e'=32.7$
$H_s'=15.2$	$H_w'=16.9$
Sum = 51.7	Sum = 49.6
Mean = 25.8	Mean = 24.8

Head south and set the deflector to 25.8, and insert fore and aft magnets until the normal deflection is obtained.

Head west and set the deflector to 24.8, and insert thwartships magnets until the normal deflection is obtained.

As the difference of the readings on headings N. and S. and on E. and W. exceeded 10 divisions of the scale, which, by virtue of the method of construction of the scale, is beyond the limits admissible under these conditions, take a new set of observations, as follows:

$H_n'=25.2$	$H_e'=27.0$
$H_s'=26.6$	$H_w'=24.6$
Sum = 51.8	Sum = 51.6
Mean = 25.9	Mean = 25.8

The magnets are then arranged to suit these new conditions, in the same manner as before.

As the mean of 25.9 and 25.8 comes within the practical limits of accuracy (0.5 being the greatest admissible difference), we conclude that the quadrantal deviation is already compensated and that the spheres are therefore well placed.

2. The exact coefficients may be easily determined by the for-

[10] See *Admiralty Manual* of 1901, p. 95.

mulæ given, or by the process indicated in the English Admiralty Manual of 1893, page 101.[11]

Example:[12]

$H_n' = 26.5$	$H_e' = 16.0$	
$H_s' = 19.6$	$H_w' = 20.3$	
$H_n' + H_s' = 46.1$	$H_e' + H_w' = 36.3$	$4\lambda H = 82.4$
$H_n' - H_s' = 6.9$	$H_w' - H_e' = 4.3$	$2\lambda H = 41.2$

$$B' = \frac{6.9}{41.2} = 0.168 \qquad C' = \frac{4.3}{41.2} = 0.104 \qquad D' = \frac{46.1 - 36.3}{82.4} = 0.119$$

B', C' and D' are expressed in circular measure; to express them in degrees (that is, as the approximate coefficients), we have

$$B = 9.6°, \quad C = 6.0°, \quad D = 6.8°.$$

Eliminating the exact coefficients from the formulæ given, we will have, for all headings, that $H' = \lambda H$. There may possibly be a value for A' or A, there may be errors inherent in the instrument, or accidental errors of observation, but they will be removed by the first operation, and will thus disappear from the second.

We have thus eliminated all the forces which produce deviation, and the compass will indicate the correct magnetic course on all headings.[13]

In conclusion, the method of using Lord Kelvin's deflector is based upon the balancing of various forces by means of the scale readings corresponding to the angle of normal deflection; that is, the angle remains constant and the forces vary.

The method of tangents, as modified by Lieutenant Clausen, which will now be explained, is preferable on account of the advantages which it possesses and because of the great ease with which experience shows that it may be used. It is based on the use of a constant magnetic force in the deflector, and by observations of the different angles which result, which give the values of the approximate coefficients at once.

[11] Omitted from the edition of 1901 because of the doubtful nature of the results.

[12] Meldau: "Zur Theorie des Deflektors," *Annalen der Hydrographie*, May, 1900, p. 217.

[13] To judge the probable length of time during which the compensation will remain effective, see the *Revista Maritima Braziliera*, of May, 1903, p. 1291.

IV. MODIFIED TANGENT METHOD.

NEW COMPENSATION OF LORD KELVIN'S COMPASS.

We have ON in the direction of the magnetic meridian (Fig. 2), where $ON=\lambda H$.[14] We have OA, the vector which represents the magnitude of the magnetic force of the deflector, which is equal to K, or $\sqrt{2}\,\lambda H$, inclined to the magnetic meridian, NOS, at an angle equal to 135° (angle NOA), with the red pole 45° to the left of north. The deflector will thus give two components, $-\lambda H$, or OS, opposite to ON, and $+\lambda H$, or OB. Thus a force of $\lambda H'$ will establish equilibrium with the force λH which controls the needle. Now, under the single action of the force OB, the needle swings to the direction OB, perpendicular to its original direction; that is, to the magnetic meridian. In other words, it will be deflected through 90° under the influence of OB.

A fundamental advantage of this method is that it keeps the needle from swinging, contrary to what we have seen in the method of sines. The formula will lose its accuracy when we place the deflector at 78° 45′ instead of 90°, because then the force of the deflector will not establish equilibrium with the magnetic force which attracts the needle, and will set up oscillations because of the difference between the forces which we use to establish the equilibrium.[15] If the angle of position be made 78° 45′, we will have a small component of the force left which will disturb the needle, instead of exactly nullifying the directive force, whereas with a normal deflection of 90° this would not be the case.

If now we suppose that the directive force is $ON'=H'$, instead of λH, the deflection will be equal to the angle $NOB'=\Delta=90°-a$.

From this we conclude immediately that the greater the force the greater the deflection, the difference $H'-\lambda H$ (small in prac-

[14] This is the force which attracts the north end of the needle after compensation. See the author's "Estudo Theorico e Pratico dos Instrumentos Nauticas de Lord Kelvin," Rio de Janeiro, 1902, p. 86.

[15] To eliminate the inconveniences which attend the use of the Thomson deflector and of the method of sines, which inconveniences are recognized but not avoided by all authors, it is advisable to use as a deflector a pair of magnets of ample strength to give a component not felt in the line NS of the compass deflected 90°. The angle of position for this power will thus be exactly 90°. For example, if the heading be N., place the magnets thwartships with the blue ends to starboard. Instead of the deflector, employ the regular compensating magnets to produce the normal deflection, placing them in their regular places in the binnacle.

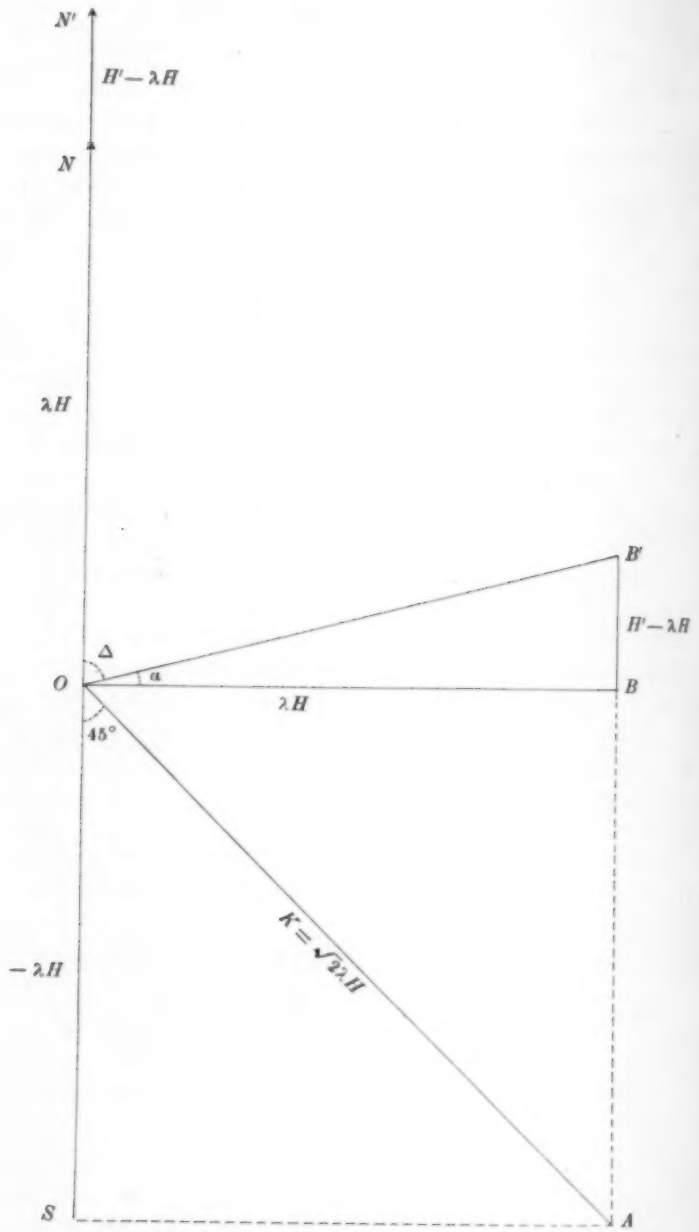


FIG. 2.

tice) is proportional to tan a, because the direction of this force is perpendicular to the original direction of the compass needle, OB'.[38]

Let us now consider the magnitude of the deflection $90° - a$, or the same a as before, to estimate the value of H'. As aforesaid, Δ_n, Δ_s, Δ_e and Δ_w are the deflections corresponding to the same headings as before, whence,

$$\tan a_n = +\lambda HD' + \lambda HB' = \cot \Delta_n, \tag{38}$$

$$\tan a_s = +\lambda HD' - \lambda HB' = \cot \Delta_s, \tag{39}$$

$$\tan a_e = -\lambda HD' - \lambda HC' = \cot \Delta_e, \tag{40}$$

$$\tan a_w = -\lambda HD' + \lambda HC' = \cot \Delta_w, \tag{41}$$

from which we derive

$$B' = \frac{\tan a_w - \tan a_s}{2\lambda H}, \tag{42}$$

$$C' = \frac{\tan a_w - \tan a_e}{2\lambda H}, \tag{43}$$

$$D' = \frac{(\tan a_n + \tan a_s) - (\tan a_e + \tan a_w)}{4\lambda H}. \tag{44}$$

We may practically consider the arcs instead of the tangents, and B, C and D instead of their sines, B', C' and D', and the formulæ then become:

$$B = \frac{a_n - a_s}{2}, \tag{45}$$

$$C = \frac{a_w - a_e}{2}, \tag{46}$$

$$D = \frac{1}{2}\left(\frac{a_n + a_s}{2} - \frac{a_e + a_w}{2}\right), \tag{47}$$

in which we use the observed deviations; or

$$B = \frac{\Delta_s - \Delta_n}{2}, \tag{48}$$

$$C = \frac{\Delta_e - \Delta_w}{2}, \tag{49}$$

$$D = \frac{1}{2}\left(\frac{\Delta_e + \Delta_w}{2} - \frac{\Delta_n + \Delta_s}{2}\right), \tag{50}$$

in which we use the observed deflections and consider λH equal to unity.

[38] See the method of tangents.

The deflection, a, is positive, or greatest, when the north point of the needle is deflected to the left of the lubber's point of observation; and negative, or least, when it is deflected to the right of the same line.

V. THE NEW METHOD.

With Lord Kelvin's binnacle, a new method may be employed to compensate the compass and to determine the values of the coefficients, and to determine the deviations from the latter.[17] This method is very simple, easy of manipulation, and involves little labor.

1. Draw, on the interior of the bowl of the compass, lubber's points corresponding to the thwartships plane through the center of the compass. These lines will be 90° distant from those already existing in the fore and aft plane. These can be located by any of the methods of elementary geometry.

2. Place two boards inside the binnacle on which to place two magnets at right angles to each other, for use instead of the deflector, by means of which we may deflect the compass according to the second of the two methods already described, by moving them toward or away from the compass. As before, suppose the ship to be heading north by compass. Place the magnets on the board under the compass needle (in the horizontal plane), in the NW.-SE., or the NE.-SW. plane, as indicated in the figure (Fig. 3, Pos. 1), selecting, say, NW.-SE. by the compass when in its position of equilibrium under the action of earth, ship and the compensators already in place in the binnacle.

The magnetic force of these magnets, which serve instead of a deflector, will be practically constant during a sufficient length of time to enable the magnets to be so placed as to exert a force equivalent to $\sqrt{2}\lambda H$, but not to make the compensation or to verify the accuracy of their place of lodgement. It is enough to be able to replace them in the same place. The position is found by means of observations ashore, about as already shown, and the rest will be merely the ordinary observations of deviation and the simple calculations for determining the coefficients B, C and D necessary for compensation.

[17] In practice it would never be necessary to determine the original deviation, because, after compensation, there will be left only the small residual deviations.

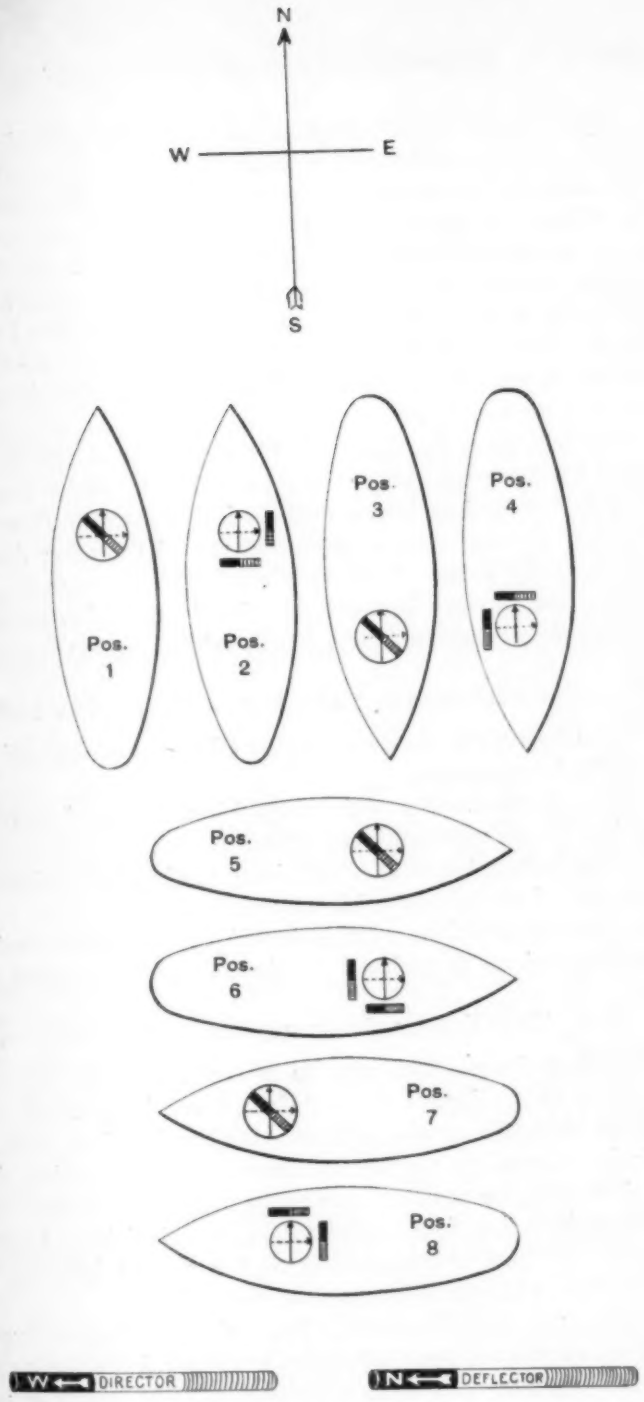


FIG. 3.

NOTE.—The full arrow represents the direction of the needle before deflection; the dotted arrow, after the normal deflection.

Beyond the practical advantage above assigned, it is important to complete the mechanical stability of the compass. Almost all the other deflectors require the manipulation of the deflector on top of the compass bowl, and therefore demand the exercise of great care not to disturb the needle mechanically. By this new method the bowl is unencumbered, having nothing on top of it.

Finally, it is practicable to so vary the positions of the two magnets that we employ as deflectors in relation to the binnacle, that we can cause any variation in the position of their magnetic axis that we require.

Certainly the advantages of this new method will be appreciated by those who know from practical experience how much labor is involved and how difficult it is to acquire the manual dexterity necessary for a successful use of the other deflectors, and especially that of Lord Kelvin with his compass.

This new method is easily capable of application to our type of binnacle (Brazilian Navy, Lord Kelvin's patent compass).

VI. COMPENSATION OF THE COMPASS BY THE NEW METHOD.

Three operations are necessary to effect the compensation and to verify its exactness.

1. The determination of the normal installation of the magnets which are to be used in place of the deflector.

2. The calculation of the coefficients B, C and D, and the compensation of the forces which they represent.

3. New observations of the deviations, and new calculations of the coefficients to verify the indications of the compass.

VII. THE NORMAL INSTALLATION OF THE MAGNETS.

The final force which acts to attract the north end of the needle on all headings is λH, called the mean force to north.

If we place the compass ashore in a place free from local magnetic forces, and, by the method described for the Kelvin deflector, determine the position of the deflecting magnets necessary to create a deflecting force equal to λH, we shall have found the position for them corresponding to the normal installation on board, from which position we may determine λ.

Replace the binnacle aboard ship, and, admitting the hypothesis that we do not have deviation resulting from the deflector magnets when in their normal installation, there would be in the compass a normal deflection of 90°.

If when we consider the normal installation corresponding to the force λH we also consider the corresponding horizontal terrestrial force in the place of H, we can determine the parameters a and e, which enter into the formation of the most important coefficients of the theory and practice of the magnetism of ships; that is to say,

$$\lambda = 1 + \frac{a+e}{2}, \quad \lambda D' = \frac{a-e}{2},$$

$$1 + a = \lambda(1 + D'), \quad 1 + e = \lambda(1 - D').$$

These reduce to

$$H_n' = H\lambda(1 + D') + \lambda HB', \tag{51}$$

$$H_s' = H\lambda(1 + D') - \lambda HB', \tag{52}$$

and

$$H_e' = H\lambda(1 - D') - \lambda HC', \tag{53}$$

$$H_w' = H\lambda(1 - D') + \lambda HC'. \tag{54}$$

By virtue of the above expressions for λ and D', we have

$$H_n' = H(1 + a) + \lambda HB', \tag{55}$$

$$H_s' = H(1 + a) - \lambda HB', \tag{56}$$

and

$$H_e' = H(1 + e) - \lambda HC', \tag{57}$$

$$H_w' = H(1 + e) + \lambda HC', \tag{58}$$

from which

$$H_n' - H = \tan a_n, \tag{59}$$

$$H_s' - H = \tan a_s, \tag{60}$$

$$H_e' - H = \tan a_e, \tag{61}$$

$$H_w' - H = \tan a_w, \tag{62}$$

which become

$$\tan a_n = aH + \lambda HB', \tag{63}$$

$$\tan a_s = aH - \lambda HB', \tag{64}$$

$$\tan a_e = eH - \lambda HC', \tag{65}$$

$$\tan a_w = eH + \lambda HC', \tag{66}$$

whence, supposing $H = 1$,

$$\lambda B' = \tfrac{1}{2}(\tan a_n - \tan a_s), \tag{67}$$

$$a = \tfrac{1}{2}(\tan a_n + \tan a_s), \tag{68}$$

$$\lambda C' = \tfrac{1}{2}(\tan a_w - \tan a_e), \tag{69}$$

$$e = \tfrac{1}{2}(\tan a_w + \tan a_e). \tag{70}$$

As before, the arcs may be substituted for the tangents of a_n, etc. Then $\lambda B'$, a, $\lambda C'$, and e will be expressed in degrees. However, the value of λ will be better determined by the foregoing formulæ.

Example:[18]

The normal installation of the deflector corresponding to the horizontal terrestrial force H, gives the following deflections:

$a_n = 6.7°$	$a_e = -18.2°$
$a_s = -9.9°$	$a_w = -8.4°$
$\tan a_n = +0.117$	$\tan a_e = -0.329$
$\tan a_s = -0.175$	$\tan a_w = -0.148$
$\lambda B' = +0.146$	$\lambda C' = +0.091$
$a = -0.029$	$e = -0.239$

$$\lambda = 0.866,$$

$$B' = 0.165, \quad C' = 0.103, \quad D' = 0.119,$$

$$B = 9.5°, \quad C = 5.9°, \quad D = 6.8°.$$

As this case is almost never used, except to determine λ and D', proceed in the following manner:

If the ship be under way (which is the practical and most convenient case), head north by compass, compare the course with that shown by another compass, and steer by the latter. Place the deflector magnet NW.-SE., with the blue end to starboard (Fig. 3, Pos. 1), and when the deflection produced is 90° note its location.

Withdraw the deflector, by so doing restoring the rose to its former position (that is, with the ship heading north by it), placing the magnet at such a distance that it exerts no influence upon the compass.

Then head south. Place the deflector again in the same place (Fig. 3, Pos. 3), with the blue end to port. Observe the deflection. If it be 90°, then the force B' and the coefficient B will be zero, and there will be no need of altering the compensation as already made with the fore and aft magnets. If there be a difference, take the half, and raise or lower the deflector magnet to obtain a deflection equal to that half. The magnetic force of the deflector is then practically equal to $\sqrt{2}\lambda H$.[19] If $D' = 0$, it

[18] Meldau, loc. cit., p. 223.

[19] The formulæ for H_n' and H_s' show perfectly the truth of this statement.

will be equal.[29] Note the number of the place, and that will be the place in which the magnet was normally installed during the operation.

VIII. CALCULATION OF THE COEFFICIENTS AND THEIR IMMEDIATE COMPENSATION.

With the deflector normally installed, and with the ship heading south by compass, observe the port lubber's point for the deflector. In the same manner observe the deflection on headings west and north.

If the deflection on N. is the same as on S., the force B' and the coefficient B will be zero, and there is no need of altering the position of the fore and aft magnets, which are already in place, or of placing new ones in the binnacle. If they be not equal, take their algebraic mean, and remove half of it by the fore and aft magnets, until the needle shows a deflection equal to that half. Then the force and the coefficient aforesaid will be eliminated.

Then observe the deflection on E., and proceed in the same manner on E. and W. to compensate for C', using the thwartships magnets.

The half-difference of the deflections observed on N. and S. represents the coefficient B.

The half-difference of the deflections observed on E. and W. represents the coefficient C.

When the half-sums of these deflections are equal, the force D' and the coefficient D will be zero.

When the half-sums of these deflections differ, half their difference will be the half-sum of the deviations due to D. Correct half of this by the spheres, as when compensating by means of the Kelvin deflector, while on heading E., or place the sphere according to the tables for the correction of the quadrantal deviation; that is, at a distance necessary to correct a quadrantal deviation equal to D.

[29] In practice we may consider $D' = 0$, since the original compensation will last for a long time. The stability of the value of the coefficient D', which is one of the most notable factors in the theory of the magnetism of the ship, enables it to be considered as practically a constant, which greatly simplifies the problem by causing it to disappear from the formulæ after being once carefully compensated.

As is known, the force $B'=cZ+P$, which varies with the geographical position of the ship. Compensate this by means of the fore and aft magnets. The separate parts, c and P, are the result: (1) c, of the vertical, symmetrical soft iron; and (2) P, of the horizontal hard iron, which, under certain conditions, makes compensation by the fore and aft magnets alone possible.

When such compensation is not possible, install a Flinder's bar (compensation of c) in such a manner as to compensate half of B (effect of B'). The other half should then be compensated by the fore and aft magnets. By this the spheres and the side corrector magnets may be accurately installed. This is the most probable compensation.

IX. NEW OBSERVATIONS OF THE DEVIATIONS, AND NEW CALCULATIONS OF THE COEFFICIENTS FOR VERIFICATION.

Owing to the inevitable errors of observation, prudence always demands that all results shall be verified. To do this repeat the preceding operations, chiefly using the approximate methods. In practice, however, if we have confidence in our own work, the residuals will be slight and may be neglected.

Practical example:[21]

1. *Normal installation of the deflector magnet.*—Place the ship on heading N. (Fig. 3, Pos. 1), and place the magnetic axis of the deflector magnet in the NW.-SE. line, with the blue end to starboard, in the place corresponding to a deflection of 90°. Withdraw the magnet, and bring the rose to its original position.

2. Swing the ship to either starboard or port, and bring her to head S. (Fig. 3, Pos. 3). Place the deflector magnet in the same plane, with the blue end to port, in a position which always makes an angle of 45° to the left of the N.-S. line of the needle. Observe the deflection. Suppose it to be 20.8° (to the right of the port lubber's point); that is, with the heading by the compass N. 20.8° W. Half of this is 10.4°; so move the deflector magnet as described before until the rose indicates a heading of N. 10.4° W. This will be the normal installation.

Repeat the operation on heading W. (Fig. 3, Pos. 7). Place the deflector magnet with the blue end to port, in the position of

[21] Taken, with modifications, from the "Lehrbuch der Navigation," Reichs-Marine-Amt, Berlin, 1900, Vol. I, p. 175.

normal installation (this corresponds to an equal deflection of the rose). Observe the deflection from the compass heading. Suppose this to be 0.4°; that is, the heading by compass being N. 0.4° E. Then head N., and install the deflector magnet normally as before. Observe the deflection from the starboard lubber's point. Suppose it to be 11.0°; that is, with the rose showing a heading of N. 11° E.:

$$\frac{a_n+a_s}{2}=\frac{11-10.4}{2}=+\ 0.3^\circ, \tag{71}$$

$$B=\frac{a_n-a_s}{2}=\frac{11+10.4}{2}=+10.7^\circ. \tag{72}$$

Compensate B by the means of the fore and aft magnets, it being the mean that the rose indicated, N. 0.3° E., from the starboard lubber's point.

Head finally on E. (Fig. 3, Pos. 5), and observe the deviation. Then place the deflector magnet in the position of normal installation, with the blue end to starboard.

It will be -10.4° deflection; that is, the rose will indicate a heading of N. 10.4° W. by the forward lubber's point.

$$\frac{a_w+a_e}{2}=\frac{0.4-10.4}{2}=-5^\circ. \tag{73}$$

$$C=\frac{a_w-a_e}{2}=\frac{0.4+10.4}{2}=+5.4^\circ \tag{74}$$

By means of the thwartships magnets compensate for this value of C, in such a way that the rose indicates N. 5° W. by the forward lubber's point.

As the difference between a_n-a_s and a_w-a_e is greater than 10°, proceed with a new compensation. This will rarely be necessary in practice.

For it we will have:

$$a_n=+0.7^\circ \text{ and } a_s=+0.6^\circ$$

and

$$\begin{aligned} a_e &= -\ 2.4^\circ \\ a_w &= -14.8^\circ \\ \hline \tfrac{1}{2}(a_w+a_e) &= -\ 8.6^\circ \\ \tfrac{1}{2}(a_w-a_e) &= -\ 6.2^\circ \end{aligned}$$

Readjust the thwartships magnets on heading E., until the rose indicates N. 8.6° by the forward lubber's point.

The compensation of the quadrantal deviation is made as follows:

$$\frac{1}{2}\left(\frac{a_n+a_s}{2}+\frac{a_e+a_w}{2}\right)=\tfrac{1}{2}(+0.65-8.6)=-3.98^\circ,$$

$$D=\frac{1}{2}\left(\frac{a_n+a_s}{2}-\frac{a_e+a_w}{2}\right)=\tfrac{1}{2}(+0.65+8.6)=4.63^\circ.$$

While on the same heading, E., move the spheres until the rose indicates N. 3.98° W., by the forward lubber's point.

Finally determine the residual deviations on the cardinal and semicardinal points, which are:[22]

$$\delta_n=0.8^\circ, \qquad \delta_s=-0.5^\circ,$$
$$\delta_{ne}=1.4^\circ, \qquad \delta_{sw}=-0.3^\circ,$$
$$\delta_e=1.5^\circ, \qquad \delta_w=0.2^\circ,$$
$$\delta_{se}=0.0^\circ, \qquad \delta_{nw}=0.0^\circ.$$

It is significant that the results of compensation by this method, without the knowledge given by azimuth observations, are comparable with, and at times will be better than, those dependent upon such observations and calculations based on observed azimuths and subject to errors in the calculations upon which they depend.

The advantages of this method of compensation are obvious, for it makes compensation possible in an hour, before leaving port, and gives results actually not more erroneous than those taken by other methods under doubtful conditions.

In many cases circumstances will not permit the loss of time involved in compensation by the method of observed azimuths and the attendant preliminary operations,[23] and in such cases it is of great advantage to know that this simple method is available.

X. Compensation and Regulation of the Compass Without Azimuths in Accordance with the Ideas Set Forth.

In Lord Kelvin's compass bowl there are drawn the lubber's points referred to above as necessary (that is, four, at 90° apart: bow, stern, starboard and port). There are also places provided for placing the deflector magnets near the compass, parallel to those provided for the compensating magnets.

[22] After the deviations have been reduced to 2 in absolute value, it is practically a waste of time to try to secure greater accuracy.

[23] See *Revista Maritima Brazileira*, May, 1903, p. 1291.

In addition to the magnets necessary for compensation, two more are provided,[24] one called the "deflector magnet," and the other the "director magnet." Each of these is marked to show its purpose, by a label pasted on it reading "deflector" or "director."

If both of these magnets have the same magnetic moment, either may be used for either purpose indiscriminately. Ordinarily this is impossible of accomplishment, however, and it will be necessary to distinguish between them.

The deflector magnet produces a force of $-\lambda H$ (see Fig. 2), and the director magnet a force which, when parallel to the line N.-S., causes a deflection of the needle to the position OB.

As it is only necessary to use the magnet which enters by the starboard door, the port door should be shut to guard against mistakes.

Proceed as before,[25] placing the ship on headings N. and S., to determine the normal installation of the deflector magnet.

On heading N. (Fig. 3, Pos. 1), the director is placed in athwartships position (the closer to the needle the greater the effect), with the blue end to starboard. Place the deflector fore and aft with the blue end aft, and at such a distance that the rose will have the normal deflection of 90°.

Now head S. (Fig. 3, Pos. 4); reverse the positions of the ends of the director and deflector, and observe the deflection. Take the half, and install the deflector normally.

Now head W. (Fig. 3, Pos. 8), placing the director fore and aft, and the deflector thwartships, corresponding to the normal installation, with the blue end to port. Observe the deflection.

Now head N., replacing the director in the original position and the deflector normally. Observe the deflection. Determine the value of the coefficient B and compensate as before.

Head finally on E. (Plate 3, Pos. 6), placing the director fore and aft, with the blue end forward; and the deflector normally, with the blue end to starboard.

Observe the deflection. Determine the value of C and D and compensate as before.

The simplicity of this method is manifest, for the process is

[24] As already stated, the regular compensating magnets may be used, but the others are better. See figures.

[25] Follow the practical example.

very easy. The director magnet is always parallel to the line E.-W. of the needle (before deflection), with its blue end to E. The deflector magnet is always parallel to the line N.-S. of the needle (before deflection), with the blue end to S. The binnacle is so arranged as to permit the proper placing of the two magnets above the regular positions of the compensating magnets, thus avoiding confusion.

XI. CONCLUSION.

We here submit to competent criticism these ideas intended to throw light on this important question of the compensation of the compass without the use of azimuths. The indifference of the nautical world to this truly ideal solution of the problem is absolutely unjustifiable.

The two new practical methods described in this paper will, I believe, introduce new possibilities to those who will study them. The first method makes use of a single magnet to produce the two indispensable magnetic forces; the second employs the two perpendicular magnets to produce the same forces. It is possible to employ indifferently the whole process or any of its component parts. Necessarily, with the second method there is more manipulation of the magnets necessary than with the first.

We have in our (Brazilian) navy a large number of Lord Kelvin's deflectors, and it is possible to use these in conjunction with one or two magnets serving as "directors."

It is, however, advisable to employ exclusively the method of tangents as modified by Lieutenant Clausen, in view of the superior facilities which it offers.

The writer's personal experience is authority for this advice, and confirms all the theories that have been advanced.

How great is the contrast between the simplicity of the solution and the complexity of the problem! Honor to them to whom we owe the final solution!

XII. COMPENSATION OF THE HEELING ERROR.

We will now show how to accomplish the theoretical compensation of the vertical force which produces deviation and mechanical disturbance of the compass prejudicial to its indications when the ship rolls. The principal part arises from the coefficient J, and is a maximum on headings N. and S. The spheres

and the Flinder's bar compensate this deviation in part. There remains the correction for the parameter c and for that part of e which enters into the expression for the heeling deviation. J represents then the permanent magnetism of the parameter R and of the induced magnetism represented by k. We will say that this will be compensated by means of a permanent magnet producing a force $-R'=J$.

When $i=0°$ (ship horizontal), the vertical forces do not disturb the indications of the needle. When the ship rolls, if the vertical forces are not zero, the rose oscillates from one side to the other.

Place the ship on heading N. or S., and one or more vertical magnets in suspension,[28] with the red or blue ends upward, according to the circumstances. Raise or lower the magnets until the oscillations are one degree or less (allow for movement of ship's head in azimuth due to the sea). In virtue of the continuity of the roll it is easy to proceed to the verification.

The magnets, finally, will be in the right position when, while steering some determined course, the rose indicates the same heading in spite of the roll.

With a change in magnetic latitude the compensation must be corrected.

[28] We suppose that the operation will be made with the compass of Lord Kelvin. The liquid compass dispenses with this correction. (This statement in regard to the liquid compasses of the U. S. Navy is not absolutely correct; they do require compensation for the heeling error, in order to eliminate oscillations due to roll.—L. H. C.)

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE FRENCH COMMISSION ON NAVAL TACTICS.

HENRI BERNAY in *Le Yacht.*

Translated by PHILIP R. ALGER, U. S. Navy.

The commission for reforming naval tactics, which is in session at the Ministry of Marine, is near the end of its labors, and this is, therefore, an opportune moment to glance at its work and to indicate, at least briefly, what its object has been and what principles have guided it.

This commission, composed of naval officers of high rank, has been presided over successively by Vice-Admirals Gervais, Fournier and Caillard, which amounts, for such as know the differences of character and tendencies of those eminent chiefs, to saying that it has not followed an undeviating course since its creation. Unfortunately, it cannot even be said that it has been uninterruptedly at work. Established in 1900, it almost completely disappeared from 1903 to 1906, the then Minister of Marine taking no trouble to replace its members as they were removed by reaching the age limit. Reorganized in 1907, and almost completely reconstituted, it has been able, in two and a half years, to complete its work without further interruption.

We shall not here concern ourselves with the part of this work that regards torpedo flotillas. We will merely state that a most satisfactory system of regulations has been constructed regarding them. The torpedo-boat tactics has been in full use since 1907, and the good results it gives in practice ought to cause the relatively slight defects alleged against it to be overlooked.

When such special weapons are considered, the use of which has an object so perfectly defined, the essential thing is to have fixed rules, covering all special cases, clearly and precisely prescribed. In such a matter imperfect rules are better than absence of doctrine. It is only just to recall that we owe to Admiral Fournier, then permanent inspector-general of flotillas, the present

tactics, which must have been in existence as long as the flotillas themselves, as they now are constituted, have been.

Tactical rules for squadrons invite a much more extended discussion. The importance of their consequences and the complexity of the questions they raise make them susceptible to the most diverse interpretations. According as the opinions of those who prepare them are more or less favorable to the use of one weapon or another; according as they are inspired by the study of actual military occurrences, or, as too often happens in times of peace, by theoretical speculations, their tendencies may be different and sometimes even opposite to one another: study of the changes in the official tactics of the French Navy admirably illustrates this evident truth.

To tell the story of these changes, we would have to go back to the work entitled "The Art of Fleets or Treatise on Naval Evolutions," in which, towards the end of the reign of Louis XIV, Père Hoste, of the Jesuit Society, commented in remarkable fashion on Trouville's tactics. Such a study, however interesting, would exceed the limits of this article. We shall, therefore, content ourselves with recalling the first official tactics adopted in France, that of 1832.

This tactics, elaborated by officers who had taken part in the wars of the Revolution and Empire, may even yet pass for a masterpiece: the detail rules that it contains, which refer to the use of weapons of that period, are determined by general principles which are independent of time. "The precepts of naval tactics," says the preface of the volume, "naturally find their place in the signal book of which they are the necessary complement." Some of these precepts are worth quoting:

"In each fleet, as in each vessel, the absolute strength must be considered, that is the material strength which results from the number of men and guns; and the relative strength which is made up of all that superiority of talent, of skill, of boldness, of energy, of perseverance, of discipline; in a word, of all that moral causes can add to the chances of success."

". . . . Skill consists in securing temporarily over one's adversary material advantage in numbers or in absolute strength by neutralizing part of his force, instead of placing oneself, as it were symmetrically, so as to fight him with equal chances."

". . . . Any plan of attack is good so long as it renders a portion of the enemy's forces useless, or places a weaker part of them under the fire of a stronger part of one's own."

"... The condition of real success in a sea-fight is to use one's guns skilfully, for to-day more than ever sea-fights are contests of artillery and of manœuvering."

Not a word in these precepts needs to be changed in order to introduce them into a tactics for the use of armored fleets. If to their statement there be added an indication of the modes by which the fleet can be brought into action and the rules of manœuvering to be followed under different circumstances, we have a complete tactics capable of inspiring leaders and of giving their subordinates full comprehension of the movements, while leaving to the former as well as to the latter—an essential point—the possibility of a fertile and at times necessary initiative.

The authors of the tactics of 1832 understood this admirably, and it is upon the same principles that Admiral Bouet-Villaumez constructed the tactics of 1861, for the use of fleets under steam. The end remained the same: to seek to crush a part of the hostile forces, and to manœuver with a view to the use of artillery, the principal weapon.

Without losing sight of these immutable principles, it was only needful to modify prudently, according as weapons changed, the prescriptions of these tactics, always to have an up-to-date code of signals. Unhappily, infatuation with the ram, which resulted from the Merrimac's actions during the American Civil War, turned minds aside from the logical way. Uncertain whether the end to be sought was battle at long range or ramming, the authors of the tactics of 1878 preferred to refrain from discussing principles, and endeavored only to give the commander-in-chief the possibility of arranging his forces in a great number of different ways and of passing from one formation to another by several methods. Tactics became mathematical; evolutions were made wantonly intricate. As to precepts for fighting, they were reduced to this: "As far as is possible, the commander-in-chief makes known in advance to the flag-officers and commanders his intentions as to the movements which he proposes to make, whether for attack or for defence."

The tactics of 1892 (which is still in force), like the preceding one, was merely a code of signals. The commission which was charged with drawing it up took for its point of departure this opinion of Admiral Duperré: "The tactical side of battle escapes, for the moment, from being governed by regulations, and it is

necessary to leave the initiative to him who is to have all the responsibilities." But it went still further than this by declaring that "an official signal book should not recommend such or such a formation for battle, it being proper to leave full latitude to the commander-in-chief."

This was to set up as doctrine the very absence of all doctrine. Fortunately, under the impulsion of Admiral Gervais, then of Admiral Fournier, and also of the Superior Naval School, where the necessity of having guiding principles was demonstrated to gifted officers by talented professors imbued with the lessons of history, a reaction could not long delay appearing, and then it was that the commission to reform the tactics was created.

As happens in all reactions, at first the object was overpassed. From the state of anarchy in which we were, it was desired to pass to autocracy. And thus it was that the "provisional tactics," whose principal author was Admiral Fournier, was put on trial in the squadrons.

In this tactics, called "without signals or compass" because the movements of ships were rigorously determined by that of the commander-in-chief, there was no longer any initiative either for commanding officers, for chiefs of divisions, or for the admiral himself. All cases were considered, and each one found in the official book precise directions as to what he should do under every circumstance. An evident abuse of central authority, which reduced leaders to the rôle of automatons and condemned in advance, for example, the manœuver of a Nelson or a Collingwood.

No sooner had this tactics been tried than the opinion of all was unanimous in condemning it. And the commission presided over by Admiral Caillard in 1907 expressed the opinion that it should be regarded as "a most important contribution to the study of battle," but no trace of it ought to remain in the official tactics.

The commission has therefore elaborated in quite a different spirit the new tactics destined in the near future to replace the tactics of 1892. Instead of giving evidence, as did that of Admiral Fournier, of universal distrust of commanders and admirals, instead of leaving these latter, as did the tactics of 1878 and 1892, a far too extended freedom, it lays down, as did the tactics of 1832— and almost in the same terms—the general principles that should govern the management of the fleet; it indicates

the means of seeking, from the opening of the action, superiority of fire by facilitating the use of the guns, and in particular the control of their fire, by methods recently established by regulation, thanks to the studies of the *Pothuau* Commission; it contemplates a much smaller number of battle formations than formerly (in particular the formation in peletons, the basis of the Fournier tactics, is suppressed), and manœuvers as simple as possible for passing from one formation to another without disturbing the gunfire; in short, it gives the "means of fighting," and, without destroying in any way either the initiative of the chief, or the dependence of subordinates, it limits both to the extent that they should be limited. It is an important work, and one whose spirit, at least, does honor to those who have brought it to a conclusion.

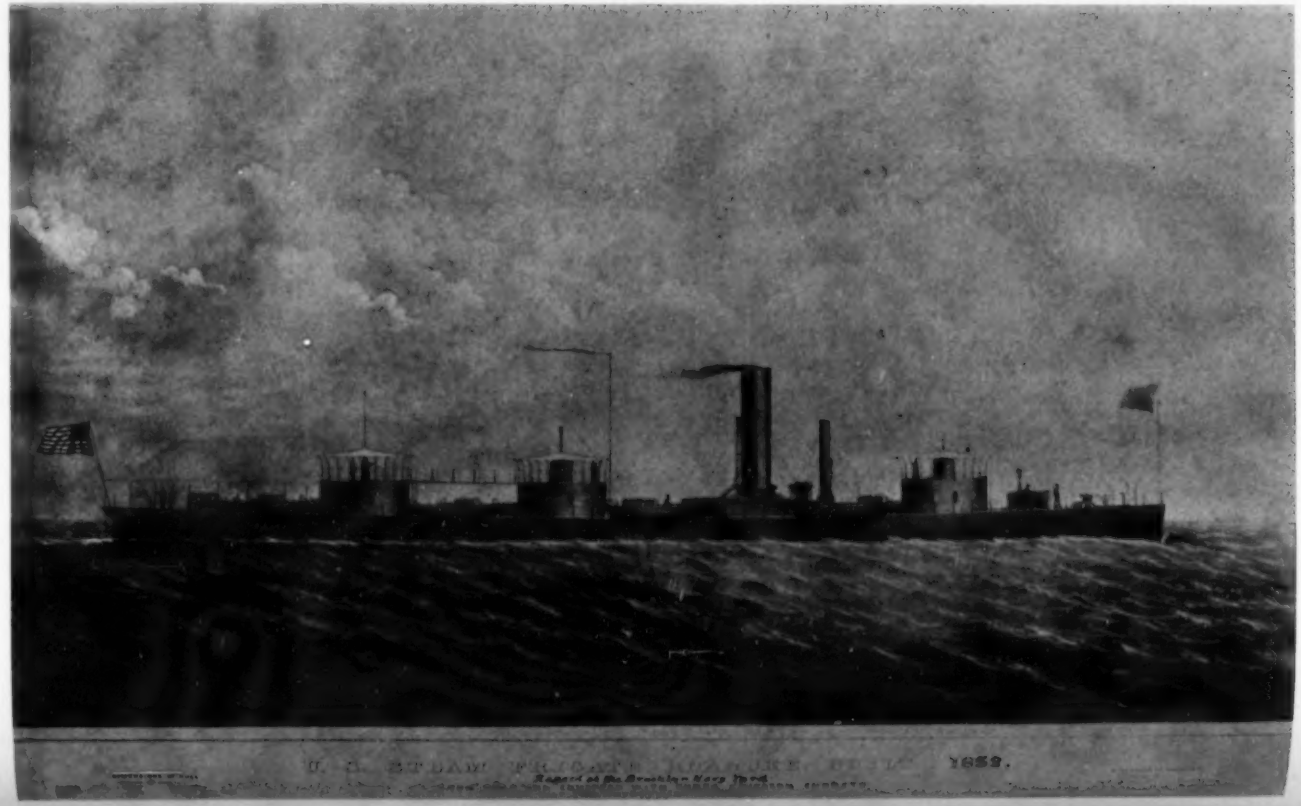
Before making it regulation, it will naturally be necessary to submit it to the test of experience. Already the Mediterranean squadron has given it a partial trial, and the observations made by Admiral Germinet have contributed not a little to perfecting it. But it will be particularly interesting to test the new tactics with a numerous fleet, that is with a union of the newly constituted first and second squadrons. As regards this, Admiral Caillard's nomination as inspector-general of squadrons furnishes every guarantee. We have only to hope that there will not be too much delay in carrying out the manœuvers—the veritable grand manœuvers necessary.

NOTE BY TRANSLATOR.—When the tactics of 1892 was applied to a fleet of twelve or more ships, the difficulty of managing so long a column, and the extreme slowness of its evolution, became apparent.

The double column was then tried, but it was soon found that more was lost by increased danger from hostile fire than was gained by increased manœuvering power.

Admiral Fournier's group system was next tested, from 1905 to 1907 When the opposing force was of sufficient number and force to manœuver at will, it was found that a fleet formed in groups of three ships could not avoid having a third of its ships almost constantly so masked by others as to be unable to fire.

Deep formations as well as one long column having been condemned, it seemed necessary to abandon the idea of having the fleet form a single mass under the control of the commander-in-chief, and it is now proposed to have semi-independent squadrons, each manœuvering in column, combining their efforts in accordance with rules laid down in advance by the commander-in-chief, and guided by his movements.



DISCUSSION.

Did Not the American Navy Invent and Use the First Dreadnought?

WM. BOERUM WETMORE, ESQ.—In the battleships of the *Lord Nelson* class of 1906, the British had come to about the limit of their intermediate battery, which consisted of ten 9.2-inch guns; these being substituted for the four 9.2 and ten 6-inch of the *King Edward VII* class launched three years previous. In this same year they also launched their first "all big gun" ship, the *Dreadnought,* by abolishing the 9.2-inch guns, substituting in their place six 12-inch guns and adding them to the four 12-inch guns, which the other two classes already had, making 10 in all and placing them in pairs in five turrets. This is the ship that in three years has revolutionized the navies of the world, all of whom are now building this class, known as *Dreadnoughts.* But was not this idea of the "all big gun" ship taken from one that was *first* produced in the American Navy?

The definition of a *Dreadnought,* as I understand it, is an armored ship, with a high free-board, carrying only guns of the largest caliber in use. These arranged on one deck in pairs and in revolving armored turrets; the number of turrets not being restricted necessarily to five. Can be one more or one less, according to the tonnage of the ship.

In 1852 there was a steam frigate built by the United States, at the Gosport Navy Yard at Norfolk, Va., and called the *Roanoke.* She was 265 feet in length, with a breadth of 52½ feet and a depth of 26.

Her machinery was built by the Tredegar Iron Works, at Richmond, Va., and consisted of a pair of trunk engines equal to 72-inch diameter and 36-inch stroke.

This frigate was anchored in Hampton Roads, at the time of the battle between the *Monitor* and *Merrimac.* After this fight which introduced to the world the revolving armored turret with its pair of heaviest guns afloat (15-inch smooth bores), she was taken to New York and razeed at the Brooklyn navy yard. Her masts and sails were removed, her sides were armored and she was equipped with three Ericsson turrets at the Novelty Iron Works, in 1863. Each of the turrets contained a pair of the heaviest guns in use and were placed fore and aft on the center line of the vessel, which is the arrangement of the turrets on American *Dreadnoughts.* The vessel had no masts and no secondary or auxiliary battery, only the "all big gun" armament.

It seems to me that the *Roanoke* complies in every way with the definition of the modern *Dreadnought,* that the idea of the *Dreadnought* was first developed in her and that she *was* the first *Dreadnought,* or in other words the great *Dreadnoughts* are developed *Roanokes.* Their arrangement of guns, armor and turrets are from her.

The *Roanoke* had no military or skeleton masts or rapid-fire guns,

these at that time not being necessary as wireless telegraphy and torpedo-boats were not then known.

The American Navy had the first steam vessel of war and the first monitor, and should it not be credited with the first "all big gun" ship, the *Roanoke*, of which the *Dreadnoughts* are but an enlargement of the same idea? I enclose a photograph of the *Roanoke* taken from a large lithograph made for the Navy Department and presented to me by the Assistant Secretary, G. V. Fox, with a number of others, in 1863.

The Visibility of Objects on a Clear, Dark Night, at Sea.

(SEE NO. 130.)

WILLARD C. TYLER, ESQ.—I have read, with much interest, the writings on this subject, in the last two issues of the PROCEEDINGS. I have voyaged in all the seas north of the equator to the extent of some 114,000 miles. My own experience has been, that under nearly all conditions of fairly clear weather, I could make out an approaching vessel or land, much better by looking at an angle a few degrees *over* it, rather than directly at it. I have proven this many times and do not understand it, as I have excellent far-sight eyes.

Another View of Alma Mater.

(SEE NO. 131.)

REAR-ADMIRAL RICHARD WAINWRIGHT, U. S. NAVY.—As with all who are interested in the Naval Academy, not only from early associations, but from constant interest in its yearly product, I have found much to attract my attention in "Another View of Alma Mater" in the September number of the PROCEEDINGS. I agree generally with Admiral Goodrich, when he states principles, but I find myself frequently at variance with him in his application of them to the Naval Academy.

One principal point of variance may be best shown by pointing out what I believe to be a serious error in Dr. Pritchett's statement as quoted by Admiral Goodrich. "In the essential things which they seek to accomplish, West Point and Harvard strive towards the same ends. . . . In the college of discipline, the tendency is to emphasize the duty to society, as represented by the organization, at the expense of the individual; in the college of freedom, the tendency is to emphasize the rights of the individual at the expense of social organization." This is true but there is a grave difference if strictly applied, for in the college of freedom the student is being prepared for a life of far more freedom than in the case of the student of the college of discipline. I believe the graduate of West Point, and I am sure the graduate of the Naval Academy must for some years after graduation live a life of fairly rigid discipline, and he must be prepared for this life as far as possible. The graduate of the Naval Academy must for some years after graduation live a somewhat unnatural life at sea and form a part of a small community that could only exist under strict discipline. Every individual as a member of society must sacrifice some of his freedom for the sake of the organization; but a naval officer must do this to far more than the ordinary extent. To

become an efficient officer on a man-of-war with the important duty of supervising American seamen without careful disciplinary training would be impracticable to the ordinary man. To again quote Dr. Pritchett with Admiral Goodrich's italics, "*discipline to be effective, must in the long run be self-discipline.*" Surely he cannot govern, who cannot first govern himself; but the road to self-discipline must be taught.

The graduate as he comes on board ship is a splendid product of careful education and to my mind his faults are not due to excess of military training at the Academy; but to lack of early discipline. We see much complaint in recent magazines of the early training of American youths. Their want of the power of conscious concentration. Even Harvard, with the freedom introduced by ex-President Elliot, is criticized. From my own observation and from what I have read I believe there is a serious error in the early methods of educating the young in this country.

It is the extension of the kindergarten system through all the graded schools and into the colleges. The misuse of the laboratory method. The painful effort to make all the paths of learning easy until the student loses the power of conquering unusual or uninteresting difficulties and loses the power of conscious concentration. We see it at the Naval Academy, when some carefully educated, brilliant young men make easy progress with the studies that attract them but fail lamentably in those they deem dry and uninteresting. Whereas other young men who have had to work hard for their little education plod along for a while, but accustomed to disagreeable work they overcome the difficulties and soon pass the brilliant students in their race for the top of the class.

It is a great pleasure to work with our young officers in gunnery and ordnance, and lately in steam; and no body of men could work harder or more effectively in this class of work, for close competition has incited warm interest; but in many duties of almost if not quite as much importance the average young officer requires frequent spurring from his seniors to keep him up to the mark. The situation would be far worse, if not practically impossible, were it not for the four years of strict discipline at the Academy. Now they generally learn after a few years at sea to take an interest in all their duties; without it few would qualify for command.

Again, as to the question of the selection of cadet officers from the first class. It certainly is a pity that all cannot have more opportunities and equal opportunity for acquiring the knowledge of handling men, the power of command. But I believe the incentive of reward and the simulating of the conditions of after life to be more important than equal opportunity. The character training both for those selected and for those who fail to obtain cadet rank is more important and lasting than any school-boyish feeling of injustice. They must learn that to obtain recognition in the service requires hard work and close attention to duty. Of course there is some talk of *greasing*, of unfair selection, but it has little depth and is generally left behind with other boyish things while the real facts remain as a lasting lesson. No human weighing machine can be perfect, but the methods of selecting the cadet officers at the Naval Academy are as

near so as possible and aptitude for the service and scholarship are carefully considered by a large body of officers. One who is so near his last sea duty may be pardoned for mentioning self and I can truly say that no lesson was more valuable to me than the one I received when I found I was one of a very few of my classmates who did not receive cadet rank. I never questioned the justice of the decision; but I did realize that being undisciplined, trying to have my own way and neglecting my duty was not the way to meet with success and consideration in the service.

I believe that dry studies and strict discipline are most necessary for the character training of the student at Annapolis. The value of mathematics and of rigid rules, in teaching him to overcome difficulties and to add the power of conscious to that of unconscious concentration cannot be exaggerated. No doubt the course and system of training at the Naval Academy may be improved, there can be no standing still; but the most important change should be made at an early age before entering the Academy. The pendulum should be allowed to swing back a little; and the child given a daily task. Not to return to the days when all studies were dry and all lessons committed to memory; but still sufficient to show him that all work is not wandering through a meadow gathering flowers by the way.

The midshipmen have a code of their own somewhat different from that in the service, but the large majority of them obey their code. He is a most successful officer who can improve their code and bring it more into harmony with the one they must live by when graduated. Then hazing, when not cruel, will always be cowardly. Gouging even when only for a two five will be cheating, and they will avoid deception even when only used to evade regulations.

The Naval Academy will be improved, is improving; but the process should be gradual, the midshipmen as a body are too well suited to the needs of the service to warrant radical remedies.

COMMANDER G. R. CLARK, U. S. NAVY.—Referring to the article "Another View of Alma Mater," by Admiral Goodrich, it may not be out of place to quote from a little talk given to the fourth class several months ago (before the publication of the article referred to), in an effort to point them fair:

. . . . "It should be the pride of a midshipman to learn, and to conform to, the customs and traditions of the service. The first and most important point to learn, the foundation of the whole structure, the beginning and end of a naval officer's career, is *duty*. When you get the right idea about duty, its importance and necessity, you will be well started on your work. Conversely, without that idea you will never make headway.

"We hear a good deal about codes, class codes and the like. There should be but one recognized, and that is the naval or government code. You owe duty, not to your class, but to the service. Your oath is not to your companions, but to the government. You can never learn to command (and that is the main object of your training) until you learn to obey, and this obedience is to be given to *all* in authority. At the hail,

"Who goes there"? stop and give the countersign, and this whether the sentry be officer, corporal or private. . . .

"In your general reading you will find occasional criticisms of this school. To reject these at once would be a mistake, but a greater mistake would be to accept and adopt them without thought or inquiry. It should be kept in mind that the education of a naval officer is like the building of the battleship he may some day command; it is necessarily a compromise; one quality has to be sacrificed, wholly or in part, for another. The naval school cannot rightly be compared with civilian schools. Here the preparation is for a particular profession; it is technical. There one may choose his subjects and limit the number to a few to which he devotes his whole time. Here there are many pebbles on the beach that must be picked up before the tide comes in, and there is a flood tide every four years."

. . . . The charge is sometimes made that graduates care but little for the Academy, that the love of the naval officer for his Alma Mater does not equal that of the Harvard or Yale graduate. It is true that young men, suddenly released from restraint, clad in their new civilian clothes, diploma stowed away in shining suit-cases, hurry away to their friends, gladly and cheerfully, heaving sighs of relief, and declaring that they hope never to see the place again. But do they really mean it? I think not. It is merely the expression of relief following the sudden release from four years of discipline, the change from the school's section room to the world's ball field, to green pastures where there are no signs "keep off the grass!" *Of course* they are glad, but, just the same, in after years they look back with feelings of pleasure and gratitude to their Alma Mater, about which cluster loving memories of pleasant experiences and loyal friendships. Deep down in their hearts they love it. Their growls are no deeper than those of the bluejacket who fights at the drop of the hat for his officer and ship.

It must be remembered that there are more "donts" and "musts" at the Naval Academy than at other schools because it is a military school. Elsewhere a student's privileges are restricted only by the size of his purse. There "his ways are ways of pleasantness and all his paths are peace." Yet we all know how prone we are to remember the pleasant things and to forget the disagreeable. Ask anyone who has spent many years at sea, and you will learn that he remembers Nice and Naples and has forgotten Panama and Panay. "All his hits are history and all his misses mystery."

"Rah, rah, navy, navy!" is the cry that goes up on the ball field. It should come from the brain and the heart, prompted by the intellect and the affections, drowning all mutterings and complaints. Let us paraphrase Decatur's words and say, "My Alma Mater, right or wrong," and remember that what Webster said of Dartmouth applies here: "It is small and has its faults, but there are those who love it." Be of that number.

LIEUTENANT RIDGELY HUNT, U. S. NAVY.—Once again has our distinguished Admiral Goodrich come to the front with suggestions for the

benefiting of the navy, the personnel, the fleet. In his recent essay "Another View of Alma Mater" he gives in agreeable words, pleasant to read and easy to understand, his views of a new order of affairs which might be brought about, or at least attempted to be instituted, in part if not wholly, at Annapolis, for the purpose of developing the undergraduates there so that from entering the Academy as undisciplined boys they shall leave it as officers and gentlemen.

Into a discussion of all the details of the plan put forward by the Admiral for a more liberal treatment of midshipmen than appears to be compatible with the rules and regulations in force to day, there is no call for me to enter, for with pretty nearly every suggested change and the reasons therefor, set before us in the Admiral's paper, I find myself in cordial agreement; and with the underlying idea—that contained in the sentence the Admiral has adopted as his motto—I am in deep sympathy. I would like now, however, to ask consideration of a few additional words of my own, on the subject of hazing. Hazing exists to a greater or less extent in all colleges, so I read, and always as a means to attain the end connoted by the expression quoted by the Admiral, "To take the freshness out of the plebes." Likewise to eradicate similar "freshness" a new member of the stock exchange is hazed and an entrant into a masonic order has to "ride the goat." This love of violent teasing or of playing practical jokes or of bringing visible discomfort and embarrassment to every new comer into an established organization, seems to be inherent in our nature whether the horse-play be authorized or not. However, the ethics or morals of hazing need not long detain us since we have to speak on only one side of the question; unauthorized hazing, that which contravenes the law; such hazing as is practiced by undergraduates and especially by the undergraduates at Annapolis and West Point, where the laws against the practice form a component part of the laws of that government these undergraduates are sworn to protect and support.

It is a curious phenomenon that at Annapolis and at West Point, where the means of preventing, detecting, and punishing hazing are always at hand and in constant evidence, this unlawful practice has greater vogue than it has in other colleges! Of these other colleges, President Nicholas Murray Butler of Columbia writes: "The crude and cruel practices of hazing, while still heard of occasionally, are much less frequent than they once were, and it is the improved tone of student opinion even more than the strict prohibitions of college authorities, that is influential in bringing this about." And of Annapolis Admiral Goodrich says, "What is needed is not so much punishment as prevention and less frequent appeal to discipline." This statement, as I understand it, has the same significance as Dr. Butler's, and means, I think, that a superintendent of rich personality and human sympathy and insight can rest assured that student opinion trusted with responsibility for the good name of a college will show itself strong and willing to protect it. From which I deduce that the wild passion of hazing which at Annapolis has in times past been rampant, can be quieted and to a great extent controlled by co-operation between the superintendent of the velvet hand and his young barbarians. And I

think that this alliance, if I may so call it, of the old with the young, of the wise with the foolish, of the tame with the wild, of the responsible with the irresponsible, will most surely conduce to the happiness of all concerned if it be buttressed by that comprehensive sentiment found in the Lord's Prayer: "Lead us not into temptation."

I appreciate so fully the wisdom of nearly every suggestion put forward by the Admiral for the betterment of academic life, that I am reluctant to disagree with any thing he says. I therefore, submit with hesitation, my opinion, that to assign every plebe to the charge of some individual first classman, as a practical help towards solving the hazing problem, will not produce the effect desired. Wise counsellors and friends some first classmen may prove to be; I was fortunate to have such a mentor; but there were other first classmen, when I was a plebe, that I intensely disliked; men whose personality was displeasing to my fastidious taste—if it so please you—and whose influence, had I been subjected to it, would certainly have been pernicious. Why? For no reason that I can adduce: one finds a Dr. Fell even among his own classmates. Again, I have heard of a three striper high stand man, subsequently dismissed for hazing, etc., who not only told plebes that they must keep below a 2.7 mark in studies, but also that the whole life at Annapolis was "rotten," there was "nothing in it" and it were "best to quit it." I only mention this exceptionally rare case, to justify my belief that while a few first classmen would considerately help their charges, the majority would, perhaps, not injure them, but makes fags of them. I think first classmen might cheer the drooping spirits of the plebes by entertaining the youngsters at afternoon tea. Why not every Saturday or Sunday at 4 authorize the first class to invite the fourth class to drop in to the class room for a cup of tea? This would give opportunity for easy conversation and the display of friendly interest. Incidentally it would be some training for the first class in the art of entertaining. Not a bad thing for a naval officer to know something about.

I venture to suggest segregation as the most important measure to adopt to protect fourth classmen from predatory hordes. Segregation of freshmen, by the way, is advocated by the Asst. Dean of Harvard who has special charge of the freshmen; and President Lowell in his inaugural approved it. By keeping each class intact its members can be more easily influenced than, it seems to me, can be the case where the men are quartered by divisions and intermingled with different classmen of diverse ways of thinking and unsympathetic to the last degree.

Segregation would increase class feeling, class interest, class loyalty and class ambition. It would facilitate comradeship and create lasting friendship; and it would promote high thinking and worthy aspirations. With the large entering classes of the present day it seems to me obvious that from segregation will result more happiness and more fondness for the good things of the Academy than can arise from any distribution of the plebes, no matter how carefully made, among upper classmen. Especially do I advise segregation of the fourth classmen if with them there be associated young officers interested in their welfare and with a brotherly affection for them. I think it would be an excellent plan to domicile with

the plebes all the young unmarried officers detailed as their instructors and officers in charge; to have these officers there as friends, to advise and help in studies as well as in conduct, combining, as it were, the duties of the preceptor and the proctor. This suggestion follows closely that of the Assistant Dean of Harvard, and I submit that it is a plan entitled to be taken into very serious consideration.

Now a few words about first classmen and their money.

I think that all of us who have had to learn by bitter experience that we cannot spend our pay and have it too—and what man of us has not had brought home to him the cruel necessity of acquiring habits of frugality—must strongly endorse the Admiral's suggestion that first classmen should handle their own pay. If, however, it be found impracticable to hand them the money outright, I venture to suggest that the superintendent might give them the free spending of it on the books, requiring them to do their own book-keeping and to submit their accounts at stated intervals to an auditor, together with a signed certificate that no debts have been incurred. It seems to me that by the adoption of such a plan the graduate would be in some small degree brought to appreciate the disagreeable necessity which will confront him all his life, of adjusting his income to his expenditures.

The Admiral also, as a means of making the Academy a better school of education and training for first classmen, urgently advises the abolition of permanency in cadet officers of all grades. And he illustrates in a plain and true way by means of an allegory the envy, hatred and heart burnings caused by withholding, arbitrarily from one midshipman any chance of technically improving himself that may arbitrarily be given to another midshipman. As the Admiral puts it, to do this thing "is a distinct violation of the equities." Here again, as in the case of the keeping of accounts, I believe nearly every officer in the service will cordially support the Admiral. Frequently have I heard complaints made of the injustice of the present method of assignment. In my own class such grumblings were constant. It seems to me that if on practice cruises it be found practicable without disrupting the organization, to compel first classmen to share equally among themselves the chances to become proficient, then it would also seem to follow that by pursuing a similar course of action on shore the organization would suffer no deterioration. On shore, as at sea, marks could be given the midshipmen for the manner in which they performed the duties of cadet officers and these marks could be made to have weight in determining the final standing at graduation. This would stir the ambition and excite the desire to excell; and each cadet officer would, during his encumbency, strive to bring the battalion, the company, the crew, into a more efficient condition than he found it.

A point not dwelt on by the Admiral in his remarks on the injustice that is worked by permanency of assignment as cadet officers, is the after effect of such ephemeral authority on the character and happiness of the whilom holders. Think what a disillusionment must come to the four stripers when with clean sleeves they go for the first time on board a cruising ship, and discover that they are really insignificant persons of no more account than the midshipman who never had even a buzzard! And they must adjust themselves to the level of these least of their classmates!

The Admiral advocates a free gate for the first class. I believe few officers will be found who are not in substantial agreement with him in all that he says under this head. Perhaps were the plan proposed adopted it might be thought advisable to impose some restrictions on the egress and ingress such as no going out during study hours and no returning later than 10 p. m. But at all other times I think the freedom of movement of the first classmen should be unimpeded. There will, of course, be diversity of opinion as to the benefits which the Admiral thinks may result to the Academy by modifying or changing the existing system in its entirety so that it shall be made to conform at least in spirit to the changes and modifications he suggests, but however divergent the views of the majority of the men of the service may be on other points, I hope we are one and all agreed that the time has come for inaugurating the policy of the open door for the first class. In this connection, I venture to suggest that the superintendent himself has the power to open the gates whenever he sees fit, without let or hindrance from anyone.

I beg to submit here a few words about the relation existing between Annapolis and Washington. How jealous the Navy Department may be of its prerogatives no one but a superintendent can fully know, and he may not always be at liberty to tell. We do know, however, that the Academy has been often interfered with and perhaps this interference has not invariably proved to be beneficial. On the other hand there may possibly have been times when Washington may have been needlessly consulted and when perhaps its interference may have been courted. I venture to whisper the thought that perhaps there may have been occasions when Annapolis thinking some change of regulations might be desirable has feared to take the initiative and has therefore shifted the responsibility to the Capital. Of course this idea of mine may be a wild one; certainly I can give it no substance; and therefore I dare say I may not be justified in expressing it, especially in view of the uncontroverted fact that examples innumerable can be adduced to show that often Washington has laid a heavy hand on our Alma Mater despite the protestations of those who know her best and love her most. None the less, however, I still think that a progressive, forceful superintendent can upon his own authority, inaugurate an order of affairs at Annapolis more in consonance with the trend of thought as expressed by Admiral Goodrich, than the rigid adherence to the customs of the past can possibly be.

I venture the opinion that a policy based exclusively on conservatism contains elements quite as detrimental to efficiency as a policy devoted exclusively to change has in it elements of danger. I believe that to advance the argument that because the men who were graduated fifty years ago became, as the result of being trained under a specific routine, distinguished officers; therefore, the men who are graduated to-day will, as the result of being trained under that same ancient routine, likewise attain distinction, is not a sound argument to bring forward, and will not lead to a safe conclusion, because it does not take into account the differences in age, education and environment between the youngster of yesterday and the youngster of to-day; and also because if this line of

reasoning be adhered to it will lead us back to the days of Adam and Eve; and the word progress will have no signification. In other words I am of those who hold that what was good enough for the fathers is not good enough for the sons. Since, therefore, I believe that the midshipman of to-day is a better midshipman than the midshipman of my day—better mentally, morally and physically—I feel that he should be better treated than I was. In saying this I do not wish to be understood as advocating the adoption by Annapolis of every change suggested by the Admiral in the essay now under discussion, for there are one or two points—for instance his probationary year, the admission of candidates on school certificates of proficiency and the abolition of study hours for first classmen—on which I disagree with him. But I heartily strike hands with him in the serious endeavor he is making, as evidenced by the contents of his admirable essay, to induce the good men in charge of our Alma Mater to take cognizance of the fact that in a college of discipline, to quote the words of Dr. Pritchett—"the standards tend to become so numerous that the process of living up to them becomes disciplinary rather than educational."

Towards the close of his remarks the Admiral says that it might be contended that if the Academy were organized on the lines he suggests it would lose its military character and degenerate into a big school for boys. I wish to go on record in answer to this as one of the "I think nots" of the ward room mess. To sustain my position I offer for consideration the conditions existing to-day on board our ships. I hear that in the granting of privileges, in the giving of liberty and money and in the whole treatment of the men there is a marked change from the customs of the past. And I also hear that the discipline, the morals and the military spirit are superior to what they were in my day. From all of which I deduce that a generous, considerate, sympathetic management of young men is not incompatible with a high state of discipline, a fine military character and a splendid esprit de corps. I therefore believe that instead of a loss of military character as likely to follow the suggestions of the Admiral, there would be a distinct gain.

The Admiral calls on us to criticise his suggestions favorably or unfavorably as we think them in the main sound or weak. To any man who has read my paper on Alma Mater, it is needless to say that I am convinced of their soundness. Therefore I only beg to add here my conviction that the sooner they are adopted and put in force the better.

I think we must all agree, even those who are not of the Admiral's way of thinking—if there be any such—that seldom has a more interesting article and one more replete with pertinent suggestions for the uplifting of the service, been laid before us. And since to my mind Annapolis—its curriculum, its discipline, its whole life theoretical and practical—represents the most important essential of our entire naval establishment, I feel particularly grateful to the Admiral for the very kindly, yet none the less able and forceful, manner in which he has drawn our attention to some of the things still left for us to do if we would make of our Alma Mater a better and safer college than she even now is for the making of the American naval officer.

PROFESSIONAL NOTES.

Prepared by Professor PHILIP R. ALGER, U. S. Navy.

SHIPS OF WAR, BUDGETS AND PERSONNEL.

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Radetsky	14,500	Trieste.	Launched July 3, 1909.
Zrinyi	14,500	"	Building.
Erzherzog Franz-Ferdinand.	14,500	"	Launched Sept. 30, 1908.
Scout.			
Admiral Spaun	3,500	Pola.	Launched Oct. 30, 1909.

If we are to believe the *Zeit*, of Vienna, two Austrian *Dreadnoughts* will be completed before the end of 1913. The financial difficulties which have arisen will not affect the matter, because the Stabilimento Tecnico Triestino will deliver the ships irrespectively of regular payments. It has declared, we are told, that thirty months should be enough for the completion of a vessel of 20,000 tons. The *Zeit* expresses the opinion that a powerful Austrian Navy is the only guarantee of peace with Italy, because the Italian circles which are hostile to the Triple Alliance will cease "to think that a naval victory in a war with Austria could compensate for a defeat on land." The same journal says that a strong fleet would be an effective protection for Austrian commerce in the Mediterranean, and that the program of construction comprises sixteen *Dreadnoughts*. The mutual suspicion that is manifested in Italy and Austria, each jealously watching the other, is certainly one of the most remarkable political symptoms of the time.—*Army and Navy Gazette.*

The torpedo cruiser *Admiral Spaun*, the first Austrian vessel of this class to be fitted with Parsons turbines, which was laid down in the naval dockyard of Pola in November, 1907, was launched on October 30. The cruiser was constructed at a cost of £364,583, and its stipulated speed is one of 26 knots per hour. Its length is 410 feet, its beam 46 feet, its draft 15 feet, and its approximate displacement 3500 tons. The armament consists of seven 3.9-inch guns, two 1.45-inch quick-firers, and three submerged torpedo tubes. A sister ship is included in next year's program of naval construction.—*Army and Navy Gazette.*

Financial difficulties are expected to lead to considerable delay in the completion of the four Austrian battleships decided on in reply to the Italian program. The year 1914 is mentioned as the probable date of completion, so that the year in which Austria will have at sea the sixteen *Dreadnoughts* of which the *Zeit* speaks as the ultimate strength of her navy, is far distant. The *Kieler Neueste Nachrichten* states that the first pair will be of 19,600 tons, carrying ten 12-inch guns in five turrets on the centre line and eighteen 4.7-inch in twin turrets.—*United Service Magazine.*

ARGENTINE REPUBLIC.

The Argentine Government, through the naval commission in London, have requested the most prominent builders of torpedo-boat destroyers to tender for 16 destroyers of 700 tons displacement, having a speed of 30 knots, the propelling machinery to be of the Curtis or Parsons turbine type. It is understood that the vessels will carry as armament two torpedo-tubes, four 4-inch quick-firing guns, and four 12-pounder quick-firing guns. The competition for the order, it is expected, will be very keen, as it is known that certain continental firms are making strenuous efforts to secure it.—*Page's Weekly.*

BRAZIL.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Minas Geraes	19,250	Elswick.	Under trial.
Rio de Janeiro	19,250	"	Ordered.
Sao Paulo	19,250	Vickers.	Launched April 19, 1909.
Scouts.			
Bahia	3,500	Elswick.	Under trial.
Rio Grande	3,500	"	Launched April 20, 1909.

The Brazilian Government has contracted with Vickers, Sons & Maxim for a floating dock, designed for the reception of battleships of the *Minas Geraes* class, and of the "bolted-sectional" self-docking type. The pontoon will be divided into three sections, having a total length of 550 feet, 6 inches, with a clear width at entrance of 100 feet. Battleships drawing up to 36 feet and displacing 22,000 tons undamaged will be lifted by the dock. The contract includes an elaborate installation of boilers, engines, cranes, electric lighting, and pumping machinery. An interesting feature is the provision of a cooking plant for 750 men for use when the galley arrangements of the docked ship are not available. The dock is to be delivered at Rio de Janeiro within eleven months from the commencement of the work, which allows the short time of about nine months for construction. The work will be watched with considerable interest in this country, in view of the decision of the Admiralty to construct two similar docks for British *Dreadnoughts*. The new dock will be the largest ever constructed in this country, and, in fact, in any part of the world outside of Germany, where there are two—one completed and one being built—of still larger capacity. The Bermuda Dock, the largest floating dock yet built in this country, has a lifting capacity of 16,500 tons. The cost of the dock will be £182,700 complete, which works out at under £8 10s. per ton of lifting capacity, or about £7 10s. per ton on the value of the work in this country, exclusive of cost of towage to Rio.—*The Engineer.*

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Danton	18,350	Brest.	Launched July 4, 1909.
Mirabeau	18,350	Lorient.	" Oct. 28, 1909.
Voltaire	18,350	Bordeaux.	" Jan. 16, 1909.
Diderot	18,350	St. Nazaire.	" Apr. 19, 1909.
Condorcet	18,350	"	" Apr. 20, 1909.
Vergniaud	18,350	La Seyne.	Building.
Armored Cruisers.			
Edgard Quinet	13,644	Brest.	Launched Sept. 21, 1907.
Waldeck-Rousseau	13,644	Lorient.	" Mar. 4, 1908.

La Vie Maritime states that the plan of having 3-gun turrets on the French battleship of the new program has been definitely rejected. These ships, provisional plans for which are being made, are to be of 23,500 tons displacement, and to carry twelve 12-inch guns in six double turrets, and eighteen 5.5-inch guns in groups of three in an armored casemate; they are also to be fitted with four under-water torpode-tubes.

With the launching of the *Mirabeau* on October 28, five of the six *Dantons* are afloat. The following description of the two *St. Nazaire* ships, taken from *International Marine Engineering*, applies to the entire class except as regards certain minor details.

The principal dimensions are as follows:

Length over all	481 feet.
Length on waterline	476 feet.
Extreme beam	84 feet, 8 inches.
Depth, at full load, amidships	27 feet, 1 inch.
Full load displacement	18,235 tons.
Designed horse-power	22,500
Speed	19.25 knots.

They have no metallic keels, simply a false keel and two docking keels of teak. The docking keels, as well as the steel bilge keels, extend for more than half the length of the ship amidships. The stem is of forged steel and the stern of cast steel. There are nine keelsons on each side of the main keel. Amidships, the frames are spaced about 34 inches center to center. The double bottom extends up to the lower protective deck. The outside plating varies from ⅜ to ¾-inch in thickness, or from 15 to 30 pounds weight. Behind the belt of side armor there is a double thickness of ⅜-inch or 15-pound plate. Numerous watertight compartments subdivide the hull from end to end. Many of these are not even pierced by watertight doors.

The general protection of the ship is according to the French principle of the "caisson blindé" in connection with a "caisson cellulaire," protecting the ship as far as possible against torpedo attack. At the center line of the ship the lower protective deck is slightly above the load-waterline. At the sides it is four feet 10 inches below this, where it is connected with the upper edge of the "caisson cellulaire." An upper protective deck is worked at the height of the upper edge of the belt of side armor; that is, eight feet above the load-waterline. This deck is constructed of three thicknesses of plate, each ⅝-inch thick. The lower protective deck is constructed of three plates each ⅝-inch thick on the flat, but on the slopes it is protected in addition by armor plates four inches in thickness.

The main armor belt extends from the stem to within a few feet of the stern. It is composed of three strakes. The lower edge of the first strake is 3.15 inches thick amidships and at the sides of the 12-inch turrets, while the upper edge is 10.63 inches thick amidships and 7.87 inches at the sides of the 12-inch turrets. Forward and aft of this the lower edge of the first strake is 2.36 inches thick and the upper edge 7.09 inches thick, while at the ends the lower edge is two inches thick and the upper edge 3.15 inches thick.

The second strake is 9.84 inches thick amidships, 9.06 inches thick at the lower edge and 7.87 inches thick at the upper edge at the sides of the 12-inch turret; forward, it is 7.87 inches thick at the lower edge and 6.69 inches thick at the upper edge; while astern it is 5.41 inches thick, and at the ends 3.15 inches thick. The third strake is 2½ inches thick and about 115 feet long, extending from the stem to a point just aft the forward 12-inch turret. The armor belt is placed on a teak backing, which has an average thickness of 3.15 inches. Forward there is an athwartship armored bulkhead, 7.09 inches thick, extending from the sides to the 12-inch center line turret. There is a similar armored bulkhead, 7.8 inches thick, at the after 12-inch turret.

The 12-inch gun turrets are protected with 11.81 inches of steel armor and the barbettes with 11.02 inches of armor. The 9.4-inch guns are protected by 8.66 inches of steel in the turrets and 7.87 inches in the barbettes.

The space between the two protective decks and the armor belt, which is termed the "tranche cellulaire," is divided into numerous small compartments, with a passage at the center line of the ship. These compartments form bunkers and store-rooms and give access to a cofferdam, which is worked throughout the entire length of the ship the total height of the armor belt. All passages, funnels, ventilators, etc., extending through the "tranche cellulaire" have been reinforced their entire height.

The "caisson cellulaire," which is designed to protect the ship as far as possible against torpedo attack, is constructed as follows:

About 8 feet 6 inches from the outside plating a vertical longitudinal bulkhead has been worked. This has an average height of 16 feet 6 inches and is made of plates having a total thickness of 1¾ inches. Behind the cofferdam and at a certain distance from it there is a second vertical bulkhead, .59 inch thick, extending from the double bottom plating to the lower protective deck. Forward and aft bunkers and other compartments provide the same protection as these bulkheads. This "caisson cellulaire" form of protection was used for the first time on board the *Czarewitch*, built in 1899 at the Forges & Chantiers de la Mediterrannée, and proved its efficiency by saving the ship from a total loss when under heavy torpedo attack.

Only one conning tower is fitted, and this is located on the navigating bridge, where a clear view can be obtained. It is noticeable that there are no obstructions on the bridge, as there are on all previous battleships or armored cruisers belonging to the French Navy. The conning tower is protected by 11.81-inch armor, while the armored tube leading to it is protected by armor 8.66 inches thick above the upper protective deck, and 2.36 inches thick between the upper and lower protective decks.

The main armament consists of four 12-inch guns mounted in pairs in two revolving turrets on the center line of the ship, one forward and one aft. There are twelve 9.4-inch guns, mounted in pairs in six revolving turrets, located on the spar deck. The secondary battery is composed of sixteen 3-inch quick-firing guns and ten 1.8-inch guns. It has been stated that two 18-inch submerged torpedo-tubes would be fitted forward, but, up to the time of launching, no special arrangements were made for them, and it is now expected that the space and weight which they would occupy will be used for ammunition for the heavy guns.

The armament of these ships has been widely criticised, but the fact still remains that these boats have been built to fight in the Northern seas, where it is very likely that the future naval supremacy will be settled by the European powers. In these waters foggy weather makes it difficult to fight at a distance much over 3000 yards. At this distance these vessels will be able to do effective work with their large quick-firing guns. At the same time such an armament is capable of making a good showing against any of the battleships belonging to the Triple Alliance in the Mediterranean. Of course, it must be admitted that this armament would be at a diadvantage in fine weather against the latest types of English or American battleships. It is practically certain that on future French battleships the *Dreadnought* idea will be carried out by using only big guns of a single caliber for the main battery, but in that case the displacement will be increased at least to 20,500 tons.

Just criticism can very well be made of the secondary battery of the *Diderot* and *Condorcet*. The 3-inch 12-pounder guns are not efficient against modern torpedo-boat destroyers. Four-inch quick-firing guns would at least be fairly efficient and it cannot be readily understood how such a small-caliber gun has been selected for this work. Also, the secondary battery is so arranged that it is practically unprotected, and

the chances are that after an engagement this indispensable battery would be out of commission.

The forward and stern fire consists of two 12-inch and eight 9.4-inch guns. The broadside fire consists of four 12-inch and six 9.4-inch guns. The anti-torpedo-boat fire on each side consists of two 3-inch guns forward and four 3-inch guns in two casemates at the center of the ship, and two 3-inch guns aft, besides the 1.8-inch guns, which are located in various commanding positions on the bridge and spar decks.

The ships will be propelled by four screws, each driven by Parsons turbine engines. There are eight turbines in each ship, four for full speed forward, two for the lower cruising speeds and two for astern speed. The dimensions of the high-speed turbines are as follows: High-pressure, diameter, 9 feet; length, 23 feet 10 inches. Low-pressure, diameter, 12 feet; length, 23 feet 6 inches. The high-pressure turbines drive the outside propellers, and the low-pressure turbines the inside screws. At full speed, the designed number of revolutions is 300 per minute. The high-pressure cruising turbines are on the inside shafts, the steam being exhausted into the high-pressure high-speed turbines and then into the low-pressure turbines. The cruising turbines are 8 feet 4 inches in diameter and 17 feet 6 inches long. The astern turbines drive the outside propellers and are 9 feet in diameter and 12 feet long. The inner shafts are located 7 feet from the center line of the ship, and the outer ones 21 feet 10 inches from the center line.

The *Diderot* and *Condorcet* will each be fitted with twenty-six Niclausse watertube boilers, each boiler having 1560 square feet of grate surface and 14,150 square feet of heating surface. The normal steam pressure will be 257 pounds per square inch. During the forced-draft trials the pressure of water in the stokehold must not exceed 1.18 inches of water.

The boiler tubes are 3 5/16 inches outside diameter and the ordinary tubes 3 1/32 inches inside diameter. The reinforced tubes are 2 27/32 inches inside diameter. There are five funnels, 83 feet high above the grates, with maximum diameters of 8 feet 3 inches and minimum diameters of 4 feet 4 inches.

For the trials of these battleships the allowable coal consumption is calculated per mile and not per indicated horse-power hour. The contract figures were as follows: For the 10-hour full-speed trial, all boilers to be worked with forced draft, coal consumption per mile run, 2060 pounds; per square meter of grate area, 287 pounds. For the 6-hour full-speed trial, with three-quarter boiler power and forced draft, the consumption per mile run is not stipulated, but the consumption per square meter of grate area is 397 pounds. For the 24-hour ordinary trial, with full boiler power at natural draft, the coal consumption is to be from 1410 to 1500 pounds per mile run and 183 pounds per square meter grate area. At low speed (10 knots), the consumption is to be from 573 to 618 pounds of coal per mile run. The total bunker capacity of each ship is 2100 tons, and the approximate steaming radius at 10 knots speed, 8130 miles.

The ships are lighted throughout by electricity and heated by steam. Only those auxiliaries requiring a large amount of power are driven by steam, all others are driven by electricity. The dynamos are driven by turbine engines. Eight searchlights are to be fitted, two forward, two in the masts, two amidships and two aft.

The estimated cost of each of these ships is as follows:

Hull and machinery	$8,331,500	(£1,712,500)
Armament	1,939,566	(398,000)
Miscellaneous	35,967	(7,380)
Total	$10,307,033	(£2,117,880)

The French submersible *Archimède*, launched recently at Cherbourg, is like the *Pluviôse*, but much larger, and is indeed the largest submarine

vessel now afloat. Her displacement on the surface is 655 tons, and submerged 810 tons. She has two steam engines and two petrol engines, and her surface and submerged speeds are respectively fifteen and ten knots.—*Army and Navy Gazette.*

CRUISES OF SUBMERSIBLES.—For a year past the submersibles built on the plans of Chief Engineer Laubeuf have been making a series of long distance runs, maneuvers, etc., which are worthy of attention.

The following is a brief account of these performances:

From October 6 to 9, 1908, the three submersibles *Pluviôse*, *Ventôse*, and *Germinal* ran 730 miles over the following course; Cherbourg to Brest, Brest to Dunkirk, Dunkirk to Cherbourg. This distance was covered without any stop in 82 hours; that is, with a mean speed of 9 knots. The boats had fine weather but were kept back by fog. During the last 17 hours, the mean speed was maintained at 10 knots without difficulty, which clearly shows that the material was not over-taxed. The trial could have been prolonged for a much greater time, the crew doing duty in watches and being able to sleep on board under excellent conditions.

From May 6 to June 11, 1909, the submersibles *Pluviôse* and *Ventôse* took part, together with two submarines (*Emeraude* and *Opale*), in the maneuvers of the Northern Squadron.

First exercise: barring the Straits of Dover.

The *Pluviôse* alone succeeded in torpedoing the squadron in its passage.

Second exercise: defense of the approaches to the harbor of Lorient.

The submersibles and submarines made more than 40 successful attacks on the vessels of the Northern Squadron, which would all have been torpedoed.

Third exercise: The submarine *Opale* having been wrecked, the two submersibles and the submarine *Emeraude* set out from Lorient and blockaded the port of Cherbourg for three days and three nights, making 12 successful attacks upon the squadron as it entered or left the harbor; then, without returning to port, they went from Cherbourg to Dunkirk and back to Cherbourg at a speed of 11 knots (9 knots only for the submarine *Emeraude*).

In this last exercise they remained six entire days without any communication with the shore, covering a total distance of 1000 miles without receiving new supplies of any sort.

These maneuvers have confirmed the comparative tests of 1905, between the submersible *Aigrette* and the submarine *Z*, by showing the superiority of boats on the Laubeuf system.

From September 6 to 8, 1909, the two submersibles *Circé* and *Calypso* made a raid from Toulon to the Strait of Bonifacio, from there to Menton, and from Menton to Toulon. The *Calypso* went 560 miles without stopping, in 59 hours. The *Circé* suffered some trifling damage to her tubes, which obliged her at first to slow down and then to put into Nice for a few hours.

The submersibles had good weather from Toulon to Bonifacio, but then they experienced a strong easterly blow, and until their return to Toulon they had a sea from three to four meters high, first abeam and then from astern, in which they behaved admirably.

In September 1909 again, the *Floréal* went from Cherbourg to Brest and back, stopping in at Lezardrieux and at Saint Malo; the *Prairial* from Cherbourg to Calais; the *Pluviôse* from Cherbourg to Dunkirk and back, with stops at Dieppe and Havre; the *Circé* went from Toulon to Bizerta, her new home port, etc.

But the most remarkable series of runs is beyond doubt that which was executed by the submersible *Papin* from the port of Rochefort.

From September 6 to 9, 1909, this boat went from Rochefort to Cherbourg, putting in at Brest.

September 22 to 23, she returned from Cherbourg in one stretch.

Leaving Rochefort, convoyed by the *Henry IV*, for Bizerta, she made the run from Rochefort to Oran in one stretch in six days from September 28 to October 4, a distance of 1200 miles, covered partly during bad weather. She then started for Bizerta, where she arrived on October 12. She thus covered a distance of over 2000 miles, from September 21 to October 12. The distance of 1200 miles without stop is much the longest covered by a submarine boat in France or in any foreign country. The English and American submarines have never made more than 300 miles without stopping; the German *Ul* went from Heligoland to Kiel (600 miles); the Swedish *Hvalen*, built in Italy, attracted great attention by her run from Spezzia to Cartagena, which was not 700 miles.

It will be seen, therefore, that the *Papin* made a record of which the French Navy has a right to be proud.

All the French submersibles referred to above were built upon the plans of Engineer Laubeuf.—*Le Yacht.*

REPORT OF THE PARLIAMENTARY COMMISSION OF ENQUIRY INTO THE STATE OF THE NAVY.—The following abridgement is given by the *Temps:*

I. *Naval Construction.*—The Commission having ascertained that in the last ten years Parliament has been asked to authorize the commencement of ships, the plans of which, for the most part, had not been definitely decided on.

That months and years generally separate the different contracts for hull, turrets, boilers, etc., entailing a considerable loss of time and money, and that this has been notably the case with the battleships of the *Patrie* class and the armored cruisers *Waldeck-Rousseau*, *Ernest-Rénan*, and *Edgar-Quinet*.

That, moreover, important changes have been made during the building of ships, notably as regards the artillery of the *Justice*, *Démocratic Liberté*, *Vérité*, and the armored cruisers *Ernest-Rénan*, *Waldeck-Rousseau*, and *Edgar-Quinet*, changes which tend to destroy homogeneity—one of the most important characteristics of a good fleet.

That the greater part of these defects are aggravated in the six battleships of the *Danton* class, the preliminary contract for which, signed in December, 1906, has had hundreds of changes made in it since.

Proposes to the Chamber:

1. To severely blame such proceedings, which are prejudicial to the public finances, and incompatible with rational, methodical and rapid construction.

2. And that it should decide that henceforth it will only authorize the construction of a ship after receiving assurances that the plans are at least in all essential particulars definitely drawn and the contract ready for signing.

II. *Arsenals.*—The Commission having ascertained that our naval arsenals are not actually in a condition to satisfactorily and with requisite rapidity carry on at the same time both new construction and repairs to ships of the fleet.

That tools and machinery are, generally speaking, insufficient and out of date.

That the abolition of piecework coincident with a reduction in the daily hours of labor, and the weakening of the power and authority of the heads of departments, has been the consequence of a notable diminution in production.

That a want of material has sometimes caused a stoppage of work.

Proposes to the Chamber to decide:

That in the interests of the navy, as well as of the public finances, our arsenals be supplied with modern tools and machinery to admit of a *maximum* production in a *minimum* time.

That it must be firmly maintained that work goes on for a full eight hours daily.

That piecework be re-introduced as far as possible, together with equitable remuneration, experience at Brest and Ruelle having shown that its introduction has produced excellent results.

That in certain workshops, where it would not be advisable to introduce piece work, the workmen to receive sufficient wages to make up the difference.

That the decree of June 13, 1907, be revised so as to give heads of departments greater powers of reward and punishment.

That before sending any work to be carried out by a private firm it be ascertained whether the arsenals are in a position to undertake it.

And for the prompt execution of work often delayed by reference to the Central Authority, greater power of decision be vested in the *Préfets Maritimes* and the Commanders-in-chief of the squadrons.

III. *Contracts for the Navy.*—The Commission having ascertained:

That prices of materials for the navy have increased of late.

That the prices of turbine engines in particular appear excessive.

That this increase in price may be attributed in great measure to the fact that the Navy Contracts department does not stand out sufficiently against the demands of contractors, and that too many useless clauses are inserted in the contracts.

Proposes to the Chamber:

To request the Control department to endeavor by every means to obtain a reduction of prices, particularly by the suppression of certain penalties in the terms of contract which are of no use to the navy.

To abolish, except in certain cases, all premiums to contractors, simply requiring the results which are thought necessary and sufficient.

IV. *Boilers.*—The Commission proposes that the Chamber should express its regret:

1. That for the past ten years Ministers of Marine have neglected to employ competition to obtain a reduction of prices in the purchase of two boilers which are considered the best;

2. That the Minister of Marine, having in a letter of August 5, 1905, consulted the technical committee as to the type of boiler to be adopted for the *Edgar-Quinet* and *Waldeck-Rousseau*, did not afterwards apply for tenders from the four firms designated by the committee, but selected two firms only from the list supplied;

3. That for the six battleships of the *Danton* class, the Minister, without even consulting the Technical Committee, took upon himself to order an equal number of boilers from the before-mentioned two firms;

4. That in his selection of boilers the Minister has not, in the majority of cases, chosen the type which the Commission of Enquiry have found to be most in favor with naval engineers and mechanicians;

And decides that henceforth, unless it be explained to Parliament that it is impossible, tenders shall always be asked for from all the firms recommended by the Technical Committee.

V. *Artillery.*—The Commission having ascertained:

That the four divisions of battleships and the divisions of armored cruisers of the Mediterranean fleet have not their full allowance of steel shell on board.

That the two divisions of armored cruisers of the Northern squadron have not the third of their regulation supply of those projectiles.

That for both the Mediterranean and Northern squadrons there is no reserve stock of steel shell ready.

Considering,

That it appears from the statements of the Minister of Marine and the artillery department that the problem regarding steel explosive shell was decided for small caliber guns in 1905 and for heavy guns in 1906,

Proposes to the Chamber,

To express its serious regret that the necessary diligence has not been shown during the last three years to furnish our squadrons with this projectile and to constitute a reserve stock.

The Commission having also ascertained,

That it was only towards the end of February, 1909, that the pattern of shell was decided on for the six battleships of the *Danton* class which were ordered in December, 1906, and are due to be completed in December, 1910, and that the time is now too short to allow of the necessary quantity of shell being manufactured by the latter date, and that also no credit has been taken in the budget of 1909, for this purpose,

Proposes to the Chamber,

To blame the improvidence and dilatoriness which this situation reveals.

VI. *Docks and Arsenals.*—The Commission having ascertained:

That the program of works drawn up in 1901 to place the military ports in a position to deal with the new ship construction of 1900 has only been partly executed,

That nothing has been done up to the present to provide docking accommodation for the battleships of the 1906 program,

Proposes to the Chamber,

To blame the improvidence and carelessness which these facts display.

VII. *Central Administration.*—The Commission having ascertained,

That neither unity of views, co-operation, method nor definite responsibility exists between the different branches of the central administration, and that there is too often negligence and confusion,

Proposes to the Chamber,

To order a reorganization of the central administration, which will assure co-ordination of effort and leave the head of each great department responsible for carrying out the measures which have been decided upon after collective deliberation under the presidency of the Minister.

This report of the Commission of Inquiry is being debated in the Chamber, and resulted indirectly in the fall of the Clemenceau Ministry on July 18.—*United Service Institution.*

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Rheinland	18,500	Stettin.	Launched Sept. 24, 1908.
Posen	18,500	Kiel.	" Dec. 12, 1908.
Ost-Friesland	21,000	Wilhelmshaven.	" Sept. 30, 1909.
Thüringen	21,000	Bremen (Weser Yard).	" Nov. 27, 1909.
Helgoland	21,000	Kiel (Howaldt).	" Sept. 26, 1909.
Ersatz Frithjof	21,000	Elbing (Schichau).	Building
" Hildebrand	21,000	Kiel (Kaiserliche W.).	Ordered.
" Heimdall	21,000	Stettin (Vulkan).	"
Armored Cruisers.			
Von Der Tann	19,000	Hamburg.	Launched March 20, 1909.
G	22,000	"	Building.
H	22,000	"	"
Protected Cruisers.			
Kolberg	4,300	Danzig.	Under trial.
Mainz	4,300	Stettin.	" " Jan. 23, 1909.
Koeln	4,500	Kiel.	Launched June 7, 1909.
Augsburg	4,500	"	" July 10, 1909.
Ersatz Falke	.....	.....	Ordered.
" Bussard	.....	.....	"

La Vie Maritime states that the *Ersatz Hildebrand* and *Ersatz Heimdall*, the second and third of the 22,000-ton battleships of the 1909 program, have just been ordered. They are to be completed in the autumn of 1912. The first is to have Parsons turbines and the second A. E. G. (improved Curtis) turbines.

The *Nassau* and *Westfalen*, the first two German *Dreadnoughts*, have completed their trials and entered regular service. They are reported to have made 20 knots speed with 24,000 horse-power, as against the designed speed of 19 knots with 20,000 horse-power. The elapsed time from the laying down of these ships to their commissioning was from 27 to 28 months. The armored cruiser *Blücher*, of 15,500 tons, has also joined the fleet.

The *Mainz* has just completed her trials. She made as high as 28 knots, with a mean of 27.5 knots (2 knots more than the contract speed), and thus broke the record for German cruisers. She was built by the Vulcan works and is fitted with A. E. G. turbines (a combination of the Parsons and Curtis systems built by the Allgemeine Electricitaets Gesellschaft, of Berlin).

The commissioning of the *Nassau* gives opportunity to compare her complement with that of previous German battleships. As against 24 officers and 735 men on the *Deutschland* class, the *Nassau* carries 30 officers and 860 men; her officers are: one captain, one commander, seven lieutenant-commanders, four lieutenants, six sub-lieutenants, five ensigns (all of whom are about to be promoted to sub-lieutenant), five engineers and one surgeon.

The launchings of three of the second lot of German *Dreadnoughts*, the *Ersatz Oldenburg*, *Ersatz Beowulf* and *Ersatz Siegfried*, now named respectively *Ost-Friesland*, *Thüringen* and *Helgoland*, brings up again the subject of their still doubtful size and characteristics. The following data are probably close to the truth: 456 feet x 89 feet x 26 feet on 21,000 tions displacement; twelve 12-inch guns (in six turrets, of which two on the middle line and two on each broadside), twelve 5.9-inch guns and twenty 3.4-inch guns; five torpedo-tubes; reciprocating engines, 24,000 horsepower, 19 knots speed; complete belt of 12 inches maximum thickness.

The distribution of the German fleet between the two ports of Kiel and Wilhelmshaven will finally be accomplished on April 1, 1910. The first squadron, composed of the *Nassau*, *Westfalen*, *Hanover*, *Schlesien*, *Wittelsbach*, *Zähringen*, *Mecklenburg* and *Wettin*, will have Wilhelmshaven for its base, while the second squadron composed of the *Deutschland*, *Preussen*, *Schleswig-Holstein*, *Hessen*, *Elsass*, *Braunschweig*, *Lothringen* and *Pommern* will be based on Kiel. The total displacement (normal) of the first squadron is 110,600 tons and that of the second squadron 105,600 tons. The oldest ships of the fleet are the *Wittelsbach* class, launched in 1900 and 1901. Besides these battleships, the fleet will contain four armored cruisers and six scout-cruisers, divided into two groups, the first consisting of the *Blücher*, *Gneisenau*, *Dantzic*, *Koenigsberg* and *Dresden*, the second of the *York*, *Roon*, *Berlin*, *Lübeck* and *Stettin*.

The following is a comparison between the naval estimates for 1909 and the sums voted for 1908:

	1909.		1908.		Increase, 1909.	
	£	s.	£	s.	£	s.
Ordinary permanent estimates....	7,202,190	4	6,690,053	14	512,136	10
Shipbuilding, armament, etc.....	7,325,168	3	5,964,875	0	1,360,293	3
Extraordinary expenditure	5,496,202	5	4,306,757	10	1,189,444	15
Total	20,023,560	12	16,961,686	4	3,061,874	8

The distribution of the amount estimated for the 1909 shipbuilding pro-

gram may be seen in the following table for the construction of the following ships:

	£	s.
The first-class battleship *Nassau* (*Ersatz Bayern*), 4th and final vote	243,500	0
The first-class battleship *Westfalen* (*Ersatz Sachsen*), 4th and final vote	243,500	0
The first-class armored cruiser *Blücher*, 4th and final vote	225,000	0
The first-class battleship *Rheinland* (*Ersatz Württemberg*), 3d vote	290,000	0
The first-class battleship *Ersatz Baden*, 3d vote	290,000	0
First-class armored cruiser *F*, 3d vote	375,000	0
Third-class cruiser *Kolberg* (*Ersatz Greif*), 3d vote	75,000	0
Third-class cruiser *Ersatz Jagd*, 3d and final vote	75,000	0
First-class battleship *Ersatz Oldenburg*, 2d vote	525,000	0
First-class battleship *Ersatz Siegfried*, 2d vote	525,000	0
First-class battleship *Ersatz Beowulf*, 2d vote	525,000	0
First-class cruiser *G*, 2d vote	550,000	0
Third-class cruiser *Ersatz Schwalbe*, 2d vote	125,000	0
Third-class cruiser *Ersatz Sperber*, 2d vote	125,000	0
River-gunboat *C*, 2d and final vote	15,000	0
First-class battleship *Ersatz Frithjof*, 1st vote	275,000	0
First-class battleship *Ersatz Hildebrand*, 1st vote	275,000	0
First-class battleship *Ersatz Heimdall*, 1st vote	275,000	0
First-class armored cruiser *H*, 1st vote	250,000	0
Third-class cruiser *Ersatz Bussard*, 1st vote	125,000	0
Third-class cruiser *Ersatz Falke*, 1st vote	125,000	0
Tender for torpedo-boat flotilla, 1st vote	10,000	0
Flotilla of torpedo-boats, 1st vote	500,000	0
Flotilla of torpedo-boats, 2d and final vote	455,000	0
Construction of and experiments with submarines	500,000	0
Total	6,997,000	0
For the gun and torpedo armaments of new ships, and mines	3,991,000	0
Miscellaneous expenditure: dockyards, etc	586,168	3
	11,574,168	3
From which has to be deducted, credited in the extraordinary estimates	4,249,000	0
Leaving total	7,325,168	3

The maneuvers of the German fleet have been in progress in the Eastern Baltic, and the Emperor reviewed the High Sea fleet and its reserves off Binz in the island of Rügen, afterwards with Admiral von Tirpitz going on board the *Deutschland*, Prince Henry of Prussia's flagship. Landing operations on the coast of Schleswig-Holstein are to take place. The High Sea fleet consists of sixteen battleships (Vice-Admirals von Holtzendorff and Schröder) and three armored and six small cruisers constitute its scouting groups (Rear-Admiral von Heeringen). A third squadron has been constituted for the maneuvers, consisting of the eight old coast-defence ironclads, under command of Rear-Admiral Pohl; and a fourth squadron, mobilized in the middle of last month under command of Vice-Admiral Zeye, consists of the *Schwaben, Württemberg, Kurfürst Friedrich Wilhelm, Prince Adalbert*, and the small cruisers *Stuttgart* and *Undine*. The seconds in command are Rear-Admirals Grapow, Gühler, Jacobsen and von Krosigk. Five torpedo flotillas are also taking part in the maneuvers, being two training, one maneuvering and two reserve flotillas, but only one of them consists of the smaller and older class of boats. Mine-search divisions and two mining vessels are also engaged.

With the addition of the *Nassau* and *Westfalen* to the High Sea fleet, the principal base of the German Navy will be transferred to the North Sea, where Wilhelmshaven has been developed into a first-class naval port. The first squadron will have its base there from April 1, 1910, a change which is viewed with some apprehension at Kiel. The widening and deepening of the Kaiser Wilhelm Canal is a work that must occupy many years, and it is expected to absorb a sum of about eleven millions sterling. There are some German officers who think that the money might be better spent, but the strongest feeling is expressed, especially at Kiel, that the work should be speedily put in hand and be pressed forward energetically. The proposal is to straighten the canal wherever possible by cutting off the inner sides of curves, but otherwise to double the width by working on one side only of the waterway. The great high-level bridges at Levensau and Grünenthal will have to be rebuilt, and of course the locks must be reconstructed. The need of widening and deepening the canal, and the grounding of the *Westfalen* in the river Weser, are indications of the colossal difficulties that confront Germany in her building of *Dreadnoughts*. Vice-Admiral Galster and many other officers are opposed to the *Dreadnought* policy in the situation which nature and the demands of the army have imposed upon Germany. There is also a strong feeling that the private yards, which have invested so much money in the provision of shipbuilding resources, should be encouraged rather than the state yards. The latter have certainly had a good share of work, and while vast sums have been expended at Wilhelmshaven, the Imperial Yard at Kiel has received many new buildings and much new plant.—*Army and Navy Gazette.*

GREAT BRITAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
St. Vincent	19,250	Portsmouth.	Under trial.
Collingwood	19,250	Devonport.	Launched Nov. 7, 1908.
Vanguard	19,250	Vickers.	Under trial.
Neptune	20,250	Portsmouth.	Launched Sept. 30, 1909.
Colossus	20,250	Palmer's (Jarrow).	Building.
Hercules	20,250	Scotts (Greenock).	"
Orion	22,500	Portsmouth.	"
Armored Cruisers.			
Indefatigable	18,000	Devonport.	Launched Oct. 28, 1909.
Lion	26,350	"	Building.
Cruisers.			
Bellona	3,400	Pembroke.	Under trial.
Blanche	3,400	"	Launched Nov. 25, 1909.
Blonde	3,400	"	Ordered.
Blonde	3,400	"	Ordered.
Liverpool	4,800	Vickers.	Launched Oct. 30, 1909.
6	5,000	"	Ordered.
Bristol	4,800	Brown & Co.	Building.
Gloucester	4,800	Beardmore.	Launched Oct. 28, 1909.
7	5,000	"	Ordered.
Newcastle	4,800	Armstrong.	Building.
8	5,000	"	Ordered.
Glasgow	4,800	Fairfield.	Launched Sept. 30, 1909.
9	5,000	London & Glasgow Co.	Ordered.

THE "NEPTUNE."—On September 30, the *Neptune*, the eighth and largest British *Dreadnought*, was launched at Portsmouths. Her dimensions are understood to be as follows: length, 510 feet between perpendiculars;

beam, 84 feet; displacement 20,250 tons. She will be fitted with turbine engines, to develop 25,000 I. H. P., giving a speed of 21 knots. Her armament will consist of ten 50-caliber 12-inch guns of the latest pattern, disposed in five turrets, three of which will be on the central line, and one on each side of the ship, these latter being placed *en échelon*. She will thus be able to fire the whole of the ten guns on either broadside, whereas her predecessors could only fire eight; in addition, the middle turret on the center line will be raised and placed close forward of the after one, so that its guns can fire over it, a stern fire of eight guns, instead of six only, will be thus obtained. The secondary armament will consist of 20 guns, either 4-inch, as in the *St. Vincent* class, or possibly 4.7-inch. It is said that these guns are to be mounted in three high armored towers, one just abaft of the forward 12-inch gun-turret and two further aft, all on the middle line and connected by light bridges. The armor of the new battleship will be similar to that generally adopted in the *Dreadnought* class—namely, 11 inches of hardened steel on the side belt, tapering to six inches at the bow and five inches at the stern, while the barbettes will have protective armor 12 inches thick. The fire control station will be amidships, between the two funnels and tripod masts. She has three underwater torpedo tubes, and is fitted with electrical apparatus for working her guns and operating her auxiliary engines. The *Neptune* will be completed for sea in January, 1911, two years from the date she was laid down.

The trials of the new battleship *St. Vincent* are expected to take place in December. Those of the *Collingwood* are likely to be run somewhere about the same time. The third ship of this class, the *Vanguard*, built by Vickers, Sons & Maxim, has already carried out her trials, and although the last to be laid down, will probably be the first to be put in commission. These three ships have 9¾-inch belts instead of 11-inch, as they are all fitted with a new Vickers armor, which is considerably superior to K. C.

THE "INDEFATIGABLE."—On October 28, the *Indefatigable*, the fourth and largest British battleship-cruiser (so called), was launched at Devenport. She represents the latest development of the *Invincible* idea, and although before she enters her first commission still more powerful vessels will be on the stocks, she will for a time be the most powerful cruiser in the world. The *Invincible* and her sisters, the first cruisers to have an all big-gun armament, are 560 feet long, with a beam of 78½ feet, and a displacement of 17,250 tons. The *Indefatigable*, which for the moment stands alone, is 20 feet longer, one foot broader, and displaces 18,000 tons. She is designed also to exceed the speed of the three sisters by one knot, as she is expected to attain 26 knots, and with that object in view her turbines will develop 45,000 horse-power. Her armament and its arrangement will be similar to that of the *Invincible*, but she will carry twenty 4-inch guns in place of sixteen, the main guns being 12-inch 50-caliber pieces paired in barbettes with heavy shields as before.

The *Glasgow*, *Gloucester* and *Liverpool*, three of the five "city" cruisers, ordered in November, 1908, were launched on September 30, October 28 and October 30, respectively. A description of one will answer for all. The *Glasgow* is 453 feet in length over all, 47 feet in breadth, 16 feet 3 inches draft in normal load condition, and of 4820 tons displacement. She will be provided with Parsons turbines of 22,000 I. H. P. by the builders. There will be four shafts, with a high-pressure ahead turbine, and a high-pressure astern turbine on each of the outer shafts in watertight wing compartments. The inner shafts will be driven by low-pressure astern turbines. Her water-tube boilers are designed to use both coal and oil as fuel. The armament will consist of two 6-inch guns, ten 4-inch guns and two 18-inch broadside submerged torpedo-tubes. The vital parts are protected by an arched steel protective deck extending the full length of the ship, and the

coal bunkers are designed to give further protection to the machinery. One of the 6-inch guns will be on the forecastle deck, and there also will be a circular conning tower of special steel. The other 6-inch gun will be mounted on the upper deck, and the ten 4-inch guns will be in the waist of the vessel, to permit of a forward line of fire from two of the 4-inch guns. The forecastle has been constructed with an embrasure.

The *Invincible*, after many delays due to defects in the electric turret gear, is to be ready for sea in a few weeks, or practically nine months after first commissioning, during which time the main armament has never been fit for service.

This vessel has been the subject of many parliamentary questions, which have been unsatisfactory both from the point of view of the questions (which have been drafted to infer blame attributable to the contractors), and the answers, which have endeavored to disguise the experimental nature of the electrical turret gear.

Though the difficulties have now been thought to be overcome, it is practically certain that the experiment of electrically-worked turrets is a comparative failure, the increased speed of working as against hydraulic gear which was anticipated not having been realized.

It seems fairly certain that we shall not yet see a system superior to the hydraulic for actuating our heavy guns on board ship.—*Engineering.*

The *Bellona* returned to Pembroke Dockyard on November 12, on completing her official steam trials. She ran the 30 hours' trial at one-fifth power. During this trial the maximum speed was 15 knots. During the second 30 hours' trial she steamed at 14,400 horse-power for eight hours, and the average speed was 25 knots. During the remaining 22 hours the turbines were worked at 11,000 horse-power, and an average speed of 23.9 knots was attained. On the eight hours' full-power trial, the maximum horse-power developed was 20,000, and the average speed 25.9 knots. Steaming with wind and tide over a measured mile a speed of 28.2 knots was obtained, and against wind and tide of 26.8 knots, giving an average of 27.8 knots.—*United Service Gazette.*

NEW CONSTRUCTIONS.—The eleventh British *Dreadnought* has been laid down at Portsmouth and the fifth *Invincible* at Devonport. The former will be named *Orion*, and the latter *Lion*.

The *Orion* will be 545 feet long and displace 22,500 tons, an increase of 2250 tons over the *Neptune* class. She will carry ten 12-inch guns in five turrets, all on the middle line, with turrets numbers 2 and 4 higher than 1 and 5 so as to give four guns ahead and astern as well as ten on each broadside.

The *Lion* will constitute an immense advance over her immediate predecessor, the *Indefatigable*. She is to be 700 feet long, 86.5 feet beam, of 26,350 tons' displacement, and to have turbines of 70,000 horse-power, giving a speed of 28 knots. She will carry eight 12-inch guns in four middle-line turrets. The increased displacement is largely used to give better protection, her side armor being increased to 9 inches.

The specially interesting feature of these designs is the adoption in them of the plan of putting all the turrets on the center line, as in United States battleships.

CRUISERS.—The Admiralty have placed the orders for the four protected cruisers which were to be given out to contract under the program for this year. These vessels will be constructed one each by Vickers, Sons & Maxim; Armstrong, Whitworth & Co.; Beardmore & Co.; and the London & Glasgow Shipbuilding & Engineering Company. Two vessels of the same class have already been ordered from the Pembroke Dockyard. These vessels resemble the ships of the "city" class, of which six were ordered a year ago.

DESTROYERS.—The orders for the 20 torpedo-boat destroyers provided for in the current year's naval estimates have been apportioned—four to the Tyne yards, nine to the Clyde and seven to the south coast. These new vessels will be of the enlarged "river" class, which latter, built in 1904-1905, have each a length of 222 feet, beam of 23 feet 6 inches, draft of 9.6 feet, displacement of 600 tons, I. H. P. of 7500, and an average speed of 25½ knots. The new destroyers will be built from the Admiralty's own designs, and the hulls will, therefore, not be designed by the respective builders as was the case with the *Tribal* class of ocean-going torpedo-boat destroyers launched two years ago, and the delivery of some of which was delayed seriously by labor disputes in the north. With the exception that three of the new vessels to be built on the Clyde will be fitted with the Curtis type of turbine, whilst the other 17 will be fitted with Parsons turbines, the 20 destroyers, which are each to have a speed on trial of 27 knots, will be of precisely the same over all dimensions and equipment; they are to be delivered within eighteen months from date.

The names of destroyers have been decided upon as follows: *Fury*, A. & J. Inglis, Glasgow; *Hope*, Swan, Hunter & Wigham Richardson, Newcastle; *Sheldrake* and *Staunch*, Denny Brothers, Dumbarton; *Nemesis*, *Nereide* and *Nymphe*, Hawthorn, Leslie & Co., Newcastle; *Chameleon*, *Comet* and *Goldfinch*, the Fairfield Shipbuilding and Engineering Co., Govan; *Acorn*, *Alarm* and *Brisk*, John Brown & Co., Clydebank; *Redpole*, *Rifleman* and *Ruby*, J. S. White & Co., East Cowes; and *Larne*, *Lyra*, *Martin* and *Minstrel*, J. I. Thornycroft & Co., Woolston, Southampton.

OCEAN-GOING DESTROYERS.—The destroyer *Crusader* has been passed into service in the first flotilla. There are now nine "ocean-going destroyers in commission, the *Afridi*, *Amazon*, *Cossack*, *Crusader*, *Ghurka*, *Mohawk*, *Nubian*, *Saracen* and *Tartar;* on the completion of the *Zulu*, *Viking* and *Maori*, the first flotilla will comprise twelve 33-knot and twelve 25.5-knot boats.—*United Service Magazine.*

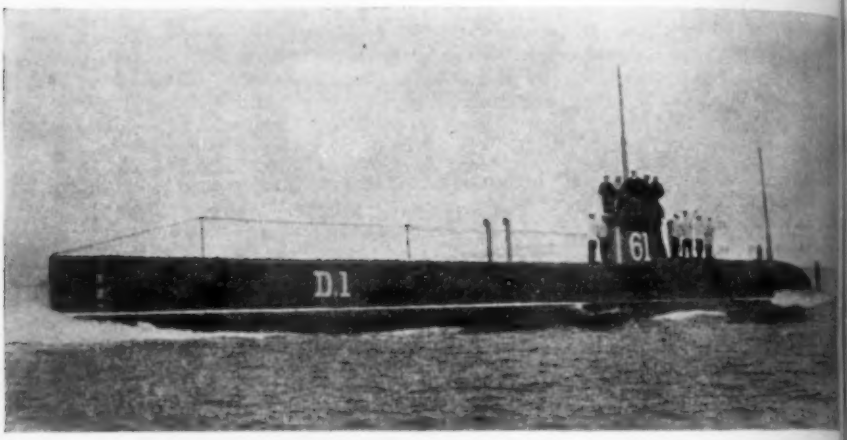
THE FOUR CONTINGENT BATTLESHIPS.—The Admiralty have invited tenders for the building of the four additional large armored ships which were included in this year's estimates as contingent on the progress made with new vessels for other powers. When the program was issued, it was announced that four armored ships, as well as various other vessels of small size, would definitely be laid down, and that "His Majesty's government may, in the course of the financial year 1909-1910, find it necessary to make preparations for the rapid construction of four further ships, commencing on April 1 of the following financial year." Not only were the ordinary ships of the year's program ordered at a very much earlier date than usual, but the four contingent ships will be ordered in January, 1910, which is earlier than sometimes happens with vessels of the ordinary program. The firms invited to tender have been asked to submit a price for building a battleship, and also a price for building a cruiser, to be completed in each case by March 31, 1912, under severe penalties for delay. The design, so far as the battleships are concerned, will follow that of the new ship laid down at Portsmouth, while the cruisers will be like the improved *Indefatigable*, just laid down at Devonport.

Many exaggerated statements have appeared in the press relative to the dimensions, speed and armament of these new ships. Such statements require to be received with caution, particularly the assertion that they will carry 13.5-inch guns. It is not improbable that further advances will be made with 12-inch guns before the very serious step of changing the standard armament is adopted. Moreover, special forgings and an entirely new design of mounting would be required, and as far as is known, the principal makers have not yet been aprroached on either point, save in a very tentative way. It has always been recognized that a bigger gun might

some day be necessary, and gun-makers have prepared designs, whilst a 13.5-inch gun has been made at Woolwich, and is now on board the *Excellent*. There is, therefore, some grounds for this rumor, but it still lacks confirmation.

A NEW SUBMARINE.—The first of a series of important trials has begun at Portsmouth with a submarine of a new and more powerful type than any in commission in the navy. The vessel, which is known as *D1* (being the first of an entirely new class), was constructed at Barrow, the greatest secrecy being observed to prevent knowledge of her new features from leaking out, and, very properly, no details as to these are allowed to be given at Portsmouth.

The only information given is that she is considerably larger than the best submarines of the *C* class, and is provided with twin screws, which give her speed and maneuvering power, besides a considerably larger



HIS MAJESTY'S SUBMARINE BOAT "D1."
CONSTRUCTED BY MESSRS. VICKERS, SONS & MAXIM, LTD., BARROW-IN-FURNESS.

radius of action both above and below the surface of the water. One improvement is a duplication of the periscope, these observation shafts—for use when submerged—being placed fore and aft. Her speed possibilities have not been thoroughly ascertained, but will probably exceed 15 knots. The vessel is regarded as experimental in many respects, and upon the reports made as to her capabilities will depend the character of others of her class now on order.—*United Service Gazette.*

The appended illustration is taken from *Engineering.*

THE SCHEME OF COAST DEFENCE.—The Admiralty are pushing along in the most satisfactory manner with their plans for completing the coast defence of the United Kingdom, which appears to mean that they intend placing a watch and ward of surface and submarine torpedo craft, like a crinoline, around the whole of the heart of the empire. Whether, and by how much, this defence on and beneath the waters will presently be supplemented by air-craft, it is not easy to foretell at the moment. The seventh section of the torpedo patrol, with the *Vulcan* as its parent ship and Dundee as its headquarters, will soon be complete, and further extensions will follow as the completed vessels come to hand. Twenty more destroyers

will shortly be laid down, the contracts and drawings having been given out, and submarines, built both in private and government yards, are monthly being added to our already splendid and efficient flotilla of underwater vessels. The latest type of submarine displaces 321 tons and has a surface speed of 13 knots, with storage capacity for 15 tons of gasoline as fuel for driving engines of 600 horse-power—about fifteen times the power of the old 40-horse-power gunboat of the sixties of last century. Pushing ahead in this fashion with torpedo craft of every class may not silence carping critics, but it will satisfy all reasonable men that their lordships are in earnest in their intention to complete their coast defence scheme as early as possible.—*United Service Gazette.*

DOVER HARBOR WORKS.—The formal opening of the Admiralty Harbor, at Dover, by the Prince of Wales, on October 15, marks the successful accomplishment of an enterprise of gigantic proportions, of which the engineers, Messrs. Coode, Son & Matthews, and the contractors, Messrs. S. Pearson & Sons, Ltd., may feel justifiably proud. These harbor works form the largest area of open sea hitherto enclosed by masonry as a harbor of refuge, the Admiralty Harbor having a low-water area of no less than 610 acres in addition to the Commercial harbor of 80 acres. Details of the scheme have already appeared in *Page's Weekly*. It has included an extension of the Admiralty Pier by 2000 feet, the formation of reclamation works for 3900 feet, at the east end of Dover, a protecting arm from the eastern end of the reclamation into the open sea for a distance of 2900 feet, and the detached south breakwater which has a length of 4200 feet. A small inner harbor, technically known as a camber, is to be constructed for the use of submarines and torpedo-boats by building a short pier at right angles to the reclamation and another at right angles to the eastern arm. On the reclamation, repair shops and an oil fuel storage depot will shortly be built. To the east of the Admiralty Pier it is intended to erect a new marine station to deal with the growing cross-Channel traffic, while the construction of landing-stages for liner traffic is being carried out by the Dover Harbor Board on the Admiralty Pier extension.—*Page's Weekly.*

Four large steel tanks for the storage of 20,000 tons of oil fuel for ships of the Royal Navy have been installed on the Port Victoria bank of the Medway, about three miles from Sheerness, and on Saturday the steamship *Bloomfield* discharged 6000 tons of oil fuel into two of the tanks. It is proposed to construct a berthage station 400 feet in length, at a depth of water sufficient to allow the largest ships in the navy to go alongside at any stage of the tide to take in fuel, which will be conveyed to the berthing stations in mains fitted under a gangway connecting with the shore. For the present, hoses 600 feet in length will be used for the discharge of oil fuel from the oil steamer and for drawing its supply for war vessels from the tanks.—*United Service Gazette.*

THE NEW PACIFIC FLEET.—The recent conference between the Admiralty and the representatives of the colonies, in respect to an imperial fleet, has allowed those responsible for the naval safety of the empire to further develop a policy of fleet redistribution which has for a long time received their attention. Several times during the last five years the naval commanders-in-chief of our Australian, China and East Indian squadrons have met at a common rendezvous close to Singapore, where they could all foregather on the very confines of their respective commands and formulate plans for the concentration of all their forces should need arise. The ships left on these stations after the so-called "scrapping" policy formed the nucleus of a Pacific fleet quite strong enough for national purposes in those days. But recent developments have made it necessary to make this fleet for the Pacific a more formidable force, and the desire of the colonies to create useful local navies has enabled the Admiralty to arrange

for the provision of a considerable addition to our naval striking power in those waters. According to present intentions we shall eventually see each of the stations named above patrolled by one battleship-cruiser of the *Indomitable* type, three second-class cruisers of the *Bristol* type, six destroyers of the *River* class and three submarines of the *C* class. Battleship-cruisers of modern type, destroyers and submarines will be quite new to the Australian and East Indian stations, and submarines will be altogether new to the Pacific, so far as the British authorities are concerned, while the whole organization looks businesslike and practical from a fighting and patrol point of view.—*United Service Gazette.*

NAVAL QUESTIONS IN PARLIAMENT.

GERMAN IN THE NAVY.—In the House of Lords Lord Ellenborough drew attention to the comparatively small number of British naval officers who had passed as interpreters of the German language, and asked whether the government would give executive officers greater opportunity for studying, and increased remuneration for the time and trouble involved in the acquisition of that language.

The Earl of Granard, in reply, said that on July 1 last 47 officers of all ranks in the navy were qualified as interpreters in German, and one had qualified since. Eleven officers, including one captain and four lieutenants, had proceeded abroad to study German since the date named. Steps had been taken recently to extend the facilities for naval officers to study foreign languages in their own time; besides those who were qualified interpreters there were many naval officers who were conversant to a certain extent with the German language.

CANING IN THE NAVY.—Mr. T. F. Richards asked whether 4566 cases of flogging with the cane were reported to have taken place in the navy during 1907, and what action, if any, would be taken to put an end to this form of punishment.

Mr. McKenna replied that he had been unable to trace the meaning of the figure suggested as to the number of cases of caning in the navy during 1907, unless it be the average number of boys borne on board ship. The actual number of canings in 1907 was under 1000. It was a mistake to use the word "flogging"; flogging and birching, though still in the list of punishments authorized by the Naval Discipline Act, had been suspended by Admiralty order, the former since 1881 and the latter since January 30, 1906. The King's Regulations authorize caning on the breech with the clothes on in the cases of boys and buglers under 18, but by Admiralty order, dated March 2, 1906, this punishment is only to be inflicted under the actual order of the captain, and is not to be carried out in public.

ADMIRALTY FLOATING DOCKS.—Mr. McKenna, replying to Mr. Renwick, said that tenders for two floating docks, suitable for vessels of the *Dreadnought* type, had recently been called for, but had not been received. No date for their completion could, therefore, be given. The decision as to the ports in which they are to be placed would be come to in due time for all necessary preparations to be made for their reception. The honorable member had never been told that two dry docks were to be ordered for Chatham and Portsmouth.

NAVAL INTELLIGENCE DEPARTMENT.—Captain Faber asked the First Lord of the Admiralty if he would state the reasons for dispensing with the services of the two naval officers of the Naval Intelligence Department who were called before the Sub-Committee of Imperial Defence by Lord Charles Beresford, seeing that no specific reorganization of the department had yet been carried out.

Mr. McKenna replied: A reorganization of the department is being carried out, and in consequence of the changes involved the services of the two officers in question will not be required after they have been carried into effect.

Mr. Lee asked whether, in view of the Prime Minister's definite pledge that officers who gave any evidence before the inquiry should not be prejudiced in any way in their careers, the right honorable gentleman would take steps to remove the unfortunate impression that would be created if this officer's career at the Admiralty came to a termination in these circumstances?

Mr. McKenna said: No unfortunate impression would be created as the honorable gentleman suggests. The services of the officer in question came to a termination in the ordinary course, and he will be employed in the ordinary course when his turn comes.

PERILS IN SUBMARINES.—Mr. George Hardy asked the Secretary of the Admiralty whether he had any official information which would lead him to believe that the bluejackets in the forward part of submarine *C11* lived for several hours after the accident, on compressed air, and only lost consciousness and life as the oxygen was used up, and that they might possibly have escaped had they been supplied with submarine helmets.

Dr. Macnamara, who replied, said: There is no truth whatever in the statement which has been made containing the suggestion referred to. The formation of chlorine gas inside the vessel must have caused death very rapidly in the cases of the men not immediately drowned. The circumstances were such that helmets could not have been used.—*United Service Gazette.*

THE HEALTH OF THE NAVY.—The Statistical Report on the Health of the Navy for the year 1908, which has just been issued, shows a continuous improvement in the general health of the fleet as compared with the preceding five years. Not only are the case, invaliding, and death ratios for the year lower than the average ratios for the last five years, but the average loss of service for each person has dropped from 11.28 to 10.36 days. The final invaliding ratio, however, shows a small increase in comparison with the previous five years' average. Three hundred and thirty-seven cases of tuberculosis are recorded, with 268 final invalidings and 37 deaths. The case, invaliding and death ratios per thousand were 3.08, 2.45, and .33 respectively, as compared with 3.41, 2.5 and .42, the average ratios of the preceding five years. The highest case ratio per thousand, viz., 4.39, is given by the Mediterranean, and the lowest, 1.9, by the Channel fleet. Among the six deaths reported in the Atlantic fleet is included that of an officer who disappeared mysteriously on the west coast of Africa. He had landed with another officer to shoot game, and subsequently they separated. He was never again seen. The theory that found most acceptance, according to report, was that an elephant had attacked him and pressed him below the surface of the swamp.

From the East Indies Station comes the only report of injuries in action. The *Prosperine* records two cases, both terminating fatally. The medical officer writes: "On the morning of April 20 the ship was patrolling the Makraan coast for arms-running dhows about 30 miles north of Jashk. A dhow was seen close inshore, so steam-cutter, cutter and whaler were manned and called away. As the water shoaled gradually the steamboat and cutter being unable to approach lay off, and the whaler proceeded. At about 150 yards from the shore a heavy fire was opened by the Afghans, who were entrenched close to the beach, a retreat was ordered from the ship, and shortly afterwards two men were dangerously wounded, one in the abdomen and the other in the chest."

On the whole the report is very satisfactory, and tells the pleasant tale that our bluejackets were more free from sickness last year than in any of the five previous years. The improvement has, moreover, been gradual and steady, and has shown itself in every direction. The Admiralty may, therefore, be congratulated on the success of their efforts to study the physical welfare of the men who form our first line of defence. This has been achieved by a more enlightened grasp of the laws of hygiene, by a closer

attention to the cooking of food, and, generally, by a more sympathetic recognition of the needs of the seaman. It is, of course, not surprising to learn that the sick rate was lower in the Channel fleet again last year, seeing that it has been in the same favorable position for three preceding years.

Apropos of this report, the publication of the Report of the Health Department of the German Navy for the year 1907 renders possible a comparison between it and the British report for the same year. The total German naval force numbers 45,776 men, and the British 108,740. Cases of disease and injury numbered respectively 25,051 and 75,351. This gives an approximate ratio in the German record of 547, and in the British of 693 per thousand. The larger ratio in the British Navy is accounted for by the greater proportion of ships employed in the tropics. It is, however, remarkable that the German ratio for ships in the Mediterranean amounts to 984 per thousand against 680 British. The ratios of venereal diseases show a large British excess, 124 per thousand, against 59 German. It is stated that elaborate prophylactic measures against venereal diseases are taken in the German Navy, whilst the men in the British fleet are virtually left to take their chance—a most deplorable fact which calls, urgently, for attention and investigation. Suicides in the German Navy amounted to 23, and in the British to 19; ratios respectively of 0.50 and 0.17 per thousand. There seems no reason why the medical departments of the two navies should not, in this essential humane endeavor, be brought into friendly relations, so that they might together study each other's problems and methods, with a view to a mitigation of all prejudicial influences affecting the health of their respective fleets. In the question of venereal disease alone it seems urgently desirable that the British authorities should make themselves fully acquainted with German methods and means of prevention.

In the present report the conditions of work in the engine-room and stoke-holds of the navy are the subject of an interesting paper by Staff-Surgeon Oswald Rees, who shows that the negro has not only the advantage in color over the white man in the sun but also in the stoke-hold, where a dark skin radiates heat better than a white one. Another curious fact is that workers in the bunkers of ships are not more liable to heat stroke than those employed in firing, although the bunkers are often much hotter than the stoke-holds, and, moreover, the air in them is almost motionless. The explanation is that the bunker men are at once covered with a layer of coal dust, which will radiate heat much faster than the naked body will.—*United Service Gazette.*

NAVAL RETIREMENT.—It was announced in Tuesday's *London Gazette* that by order in council the Admiralty have been authorized to alter the regulations governing the retirement of commanders and lieutenants. The following measures are therefore sanctioned:

1. That the numbers of officers to be promoted annually to the rank of captain and commander in this and the two following years shall be 24 and 45 respectively, notwithstanding the number of vacancies that may occur annually in those ranks: provided that the number of commanders be not allowed to fall below the establishment authorized by orders in council of November 29, 1898, and November 12, 1900.

2. The Admiralty are empowered to offer temporarily to captains, commanders and lieutenants the exceptional terms of retirement set forth in the annexed schedule.

3. The authorized establishment of lieutenants is fixed at a maximum of 1900.

These proposals take effect as from June 30, 1909, and may continue in force at the end of three years' time from that date all or such part of the exceptional terms of retirement as may be considered advisable in the interests of the naval service, with the concurrence of the treasury.

SCHEDULE.

Exceptional Retirement of Captains, Commanders and Lieutenants.
Retired Pay.

1. The scale of retired pay, according to age and service, to be as follows, for captains, commanders and lieutenants. An addition to be made, as specified, for each full year of additional service, or its equivalent, but the same not to exceed five years; and a deduction to be made for each full year wanting to complete the period specified, but the same not to exceed ten years:

Captains, Commanders and Lieutenants.

	Age.	Retired Pay.	Service, or its equivalent in half-pay time.	Addition.	Deduction.
		£	YEARS	£	£
Captains retire at age 55..	55	525	24	15	10
	54	510	24	15	10
	53	495	23	15	10
	52	480	23	15	10
	51	465	22	15	10
Commanders retire at age 50	50	450	22	10	10
	49	435	21	10	10
	48	420	21	10	10
	47	405	20	10	10
	46	390	20	10	10
Lieutenants retire at age 45	45	375	19	10	10
	44	360	19	10	10
	43	350	18	10	10
	42	325	17	10	10
	41	300	16	10	10
	40	275	15	10	10
	39	260	14	10	10
	38	245	13	10	10
	37	230	12	10	10
	36	215	11	10	10
	35	200	10	10	10
	34	190	10	10	10
	33	180	9	10	10
	32	170	9	10	10
	31	160	8	10	10
	30	150	8	10	10

Officers under 30 years of age to receive half-pay.

A commander to be entitled to a minimum rate of retired pay of £300 a year, provided he has served in that rank for a period of three years and has the requisite service in a ship of war at sea to qualify him for promotion.

Notes.

(1) The above scale of retired pay not to be applicable to officers retired for misconduct, nor to officers retired for non-service after being placed on half-pay by order of the Admiralty.

(2) Commanders and lieutenants promoted to those ranks after the introduction of these regulations to be compulsorily retired for two years' non-service instead of three as at present, except in cases of illness, where the Admiralty should have discretion to retain an officer for three year.

(3) The limit of 20 lieutenants allowed to retire at their own request annually under the age of 40 to be removed, but no lieutenant to be allowed to retire voluntarily under eight years' seniority.

It may be of interest to reproduce the old rates of retired pay of captains, commanders and lieutenants:

	Age.	Retired pay.	*Service, or its equivalent in half-pay time.	Addition.	Deduction.
		£	YEARS	£	£
Captain retire at age 55..	55	525	24	15	10
	54	510	24	15	10
	53	495	23	15	10
	52	480	23	15	10
	51	465	22	15	10
Commanders retire at age 50	50	450	22	10	10
	49	425	21	10	10
	48	400	21	10	10
	47	375	20	10	10
	46	350	20	10	10
Lieutenants retire at age 45	45	325	19	10	10
	44	300	19	10	10
	43	275	18	10	10
	42	250	18	10	10
	41	225	17	10	10
	40†	200	17	10	10

* Under Order in Council May 19, 1899, all "service" counts in full.
† Officers under 40 years of age receive active half-pay only.

—*Army and Navy Gazette.*

THE NAVAL WAR COUNCIL.—The Admiralty have issued the following statement with reference to the creation of a Naval War Council, to the development of which reference was made by the sub-committee of the Committee of Imperial Defence in their report on the state of the navy:

"In further development of the policy which has actuated the Board of Admiralty for some time past of organizing a Navy War Council, it has been decided to place on an established footing the arrangement made in previous years for the study of strategy and the consideration and working out of war plans.

"A new department called the Naval Mobilization Department has been formed under the directorship of a flag officer, and there is concentrated in it that part of the business of the Naval Intelligence Department and the Naval War College which related to war plans and mobilization. Under the presidency of the First Sea Lord, the officers directing the Naval Intelligence Department and the Naval Mobilization Department and the Assistant Secretary of the Admiralty will form the standing Navy War Council. The Assistant Secretary will act also as Secretary of the Council.

"In the absence of the First Sea Lord, the Second Sea Lord or other Sea Lord doing duty for the First Sea Lord will act as president.

"The Rear-Admiral in command of the Naval War College will be associated with the Navy War Council, and will attend and act as a member of the Council when the business is such as requires his presence. Other responsible officers will also be called in to assist and advise as the president may consider desirable.

"Consequent on these arrangements, Rear-Admiral H. G. King-Hall, C. V. O., C. B., D. S. O., has been appointed Director of Naval Mobilization. Captain M. Culme Seymour, R. N., Captain G. C. Kayley, R. N., Commander C. P. R. Coode, R. N., Commander J. H. Trye, R. N., and Commander G. M. Keane, R. N., are appointed to assist Rear-Admiral King-Hall and Captain H. H. Campbell, M. V. O., R. N., Captain A. R. Hulbert, R. N., Captain T. H. Hawkins, R. M. L. I., and Commander A. K. Jones, R. N., cease to hold appointments in the Naval Intelligence Department."—*United Service Gazette.*

THE NAVY WAR COUNCIL.—The establishment of a Navy War Council and of a Mobilization Department must be regarded as an advance in the direction of increased efficiency the value of which can hardly be overrated. The three main characteristics of the War Council appear to be its permanence of record through the agency of a secretariat, its elasticity of composition, and its conservation of the responsibility of the First Sea Lord as the Chief Naval Adviser of the Cabinet. It has been spoken of as the coping stone upon an administrative policy which synchronized with a reorganization and reconstitution of the fleet that have changed the bases of sea strategy all over the world. It is hardly this, since it can only be regarded as a further essential preliminary to the formation of a General Staff for the whole navy. It is true that the service is not yet quite certain that it wants such a General Staff; certainly it has no wish blindly to follow German methods. But a General Staff must come, and the value of the steps now taken lie in great part upon the means they afford for trial and experience in this direction. Owing to the permanent record to be made of the conclusions of the Council on such matters as it discusses, a continuity of policy should follow which has been lacking when each Sea Lord in turn was a law in these matters to himself and himself only. It must not be forgotten that there have been meetings in the past of such a character as the meetings of this Council bid fair to be, but no record of the subjects discussed, or the results arrived at, has been kept. Now, however, the plan is regularized, and the outcome cannot fail to be satisfactory. Secondly, what has been called the flexibility of membership of the Council is a good feature. Not only those officers who are *ex-officio* members will attend, but the president can at any time summon others for consultation and advice. Thus in process of time, not only the heads of the Admiralty departments, but the commanders-in-chief and other officers holding, or who have held, or who are about to hold, responsible posts afloat, may be called to attend the Council and become informed upon the subjects therein discussed. The educational value of such an organization must be, therefore, unlimited. It does not at all follow that the differences of opinion regarding important principles of naval strategy and tactics, which made such an impression upon the members of the Beresford Committee, will be reconciled or settled. It would be very much to be regretted if it were so, for anything of the kind would strike at all progressive movements and tend to destroy that individuality which is such a cherished quality of the naval profession.

Upon the third point, the position of the First Sea Lord in relation to the new Council, we have made no secret of the way in which we regard this matter. We abide by the recommendation of the Hartington Commission of 1889 that the First Sea Lord should be the adviser of the Cabinet on all great questions of naval policy. There was no disagreement upon that point. We welcomed, therefore, the reorganization of the duties of the First Sea Lord which was carried out by Lord Selborne. It was no new thing indeed, for just as former Sea Lords have prepared their war plans without the organization now established, so they acted as chief naval advisers without the regularization of their position which Lord Selborne brought about by his Order in Council. It may be that Professor Spenser Wilkinson does not recognize in Sir John Fisher the strategical war director of his dream, but he can hardly deny that the reforms which he asked for in his "Brain of the Navy," and which Colomb and others had urged before him, have been now carried out. Upon the First Sea Lord rests the responsibility for the preparation of the fleet for war, for the distribution of the fleet in times of peace and war, and for the direction of the strategy of the war whenever it comes. The system may be antiquated, but under the stress of necessity it has always been progressive, and what has happened in recent years has been that its rules have been reorganized and brought up to date. Anything that trenches upon or impairs the responsi-

bility of the First Sea Lord is unthinkable, but on the other hand it is a test of his capacity that he chooses his subordinates aright, and such choice, therefore, must be left to him and him alone. All First Sea Lords are not alike, but, as we have said before, we cannot think of Sir Cooper Key, Sir Arthur Hood or Sir Frederick Richards tolerating another and co-equal adviser of the government in the naval field during their tenure of the post now occupied by Sir John Fisher.

The institution of a Mobilization Department under the direction of a flag officer is a natural development and elaboration of the existing system. We have before referred to the growth of the Naval Intelligence Department and the Naval War College. In their development is to be found the essential preliminary steps towards the creation of a General Staff. It has been under the administration of Lord Walter Kerr and Sir John Fisher, and particularly the latter officer, that the foundations have been laid for the organization now placed upon an established footing. The increased importance of the mobilization section naturally led to, and fully justified, its establishment as a separate department. By the transference also to it from the Intelligence Department and the Naval War College of that part of their business which related to war plans and mobilization, we should arrive at a co-ordination of opinion and practice entirely salutary.

The Department of the Director of Mobilization should develop into a school of training in strategy, through which all who appear to have special gifts in this direction should pass. It should be recognized in regard to the matter of mobilization that there is an essential difference between the needs of the navy and the army in this connection. The sea has no bridges, no mountain passes, but unlimited lines of rail, so that instead of the first day of battle taking place some weeks after a declaration of war, it may be only a matter of hours before contact is made with the enemy. The germ of the naval system is, therefore, readiness to fight at the shortest notice. Preparation for this eventuality will be found to be the underlying principle of every naval reform instituted during the last six or seven years. Mobilization and action must be as near as possible simultaneous. Rightly, then, is the Director of Mobilization the official responsible to the First Sea Lord for war plans. The same department that draws the plans must see that their execution is made possible by an adequate provision of means. Finally, there is the question, yet unsettled, of the further arrangement for a special study of the higher problems of the profession by those who may be called upon to undertake the direction of fleets and squadrons, or other tactical units, in time of war. That this is a difficult question no one who has attempted its solution will deny. There must be equal opportunities for every one, and, therefore, it is probable that a course at the Royal Naval War College will be made obligatory for all whose ambition it is to rise to the higher ranks. But though training and preparation in strategical knowledge and the like may be given in this way, it does not follow that the fittest men for the essentially practical work of the navy will be found among those who take the highest places in the class-room. Clever brains are necessary, but the capacity for hard work is an asset of no small importance, and it will be unwise to draw hard-and-fast lines for flag officers in the selection of their staff. In the long run capacity and energy will tell, and the end to aim at is not so much specialization for staff duties as a general improvement in intellectual capacity, and an encouragement to all to study strategic principles and their practical application.—*United Service Gazette.*

THE NAVY WAR COUNCIL.—Strategy and actual war preparation have never before had such a preparation in British naval organization as they now receive by the establishment of a Navy War Council for that work alone. For some years back those who have followed the various stages of development through which the Naval Intelligence Department has passed,

the growth of the mobilization section, and the increasing importance of the Naval War College, have been expecting something of the kind. The points of interest were—How was it to be accomplished, and would it provide adequately for the requirements it was to fulfil without clashing with the traditions and sentiment of the sea service? Nothing is more certain with regard to any system applied to the navy than that, if it is to be a strong and natural formation on a sound basis, it must be built up upon existing institutions and grow out of experience and trial. The establishment of the new War Council is, we are told in the Admiralty's Memorandum, a development of the policy which has actuated the Board for some time past; and its purpose is to organize and place on a permanent footing the arrangements made in former years for the study of strategy and the consideration and working out of war plans. It is a comprehensive scheme, and is well devised for the object in view; and the new departure is one which will meet with the approval of all who have the interests of the navy at heart.

Many of the duties devolving on the new War Council have hitherto been carried out by the Naval Intelligence Department and the War College. The former department has been strengthened of late, and the War College at Portsmouth has also seen considerable developments. The time has come for the work relating to war plans and mobilization for war to be specially centralized, and it is now to be concentrated in a Naval Mobilization Department. There will be a standing Navy War Council, under the presidency of the First Sea Lord, and associated with him will be Rear-Admirals Bethel and King-Hall, as well as the Assistant Secretary to the Admiralty. The arrangement by which Rear-Admiral Lewis Bayley and other responsible officers will join the Board as occasion demands shows the elasticity of the constitution of the new Council, which is one of its chief qualities. It will be possible, apparently, for the commanders-in-chief afloat to take their places on the Council and give necessary assistance and advice.

Another advantage of its composition is its compactness. This small Council, by reason of its size, will be eminently practical, and its "power to add" makes it adaptable to any circumstances, problem or condition that may arise. Rear-Admiral H. G. King-Hall becomes the Director of Naval Mobilization, and a group of distinguished officers are appointed to give him their assistance in the important new work which he undertakes. Rear-Admiral Lewis Bayley is in command of the Naval War College, and will attend the War Council as a member when the business is such as to require his presence; while Rear-Admiral the Hon. Alexander Bethell, who becomes one of the permanent members, has been Director of the Naval Intelligence Department.

Under the new scheme the whole condition of the navy will be greatly improved for purposes of war, because every officer will realize that to understand war and to be master of its operations have become necessary qualifications for high commands. Another result will be that there will arise a standard of professional opinion about naval war, as a consequence of which there will be greater continuity in the policy of the Admiralty. Some time must elapse before the change will produce its full fruits, but a beginning has been made upon right lines, and satisfactory results must follow in due course. Upon questions of strategy there are as many opinions as on questions of taxation, but naval experience has reduced many of the problems to axioms. It is, therefore, essential that naval officers should not be exposed to the wind of every doctrine and that there should exist an authority which shall be not only a guide and a standard, but also an inspiration to principles and practice.

Nothing is more striking than the way in which the whole procession of incidents derives unity from this final work with which the name of the

First Sea Lord will ever be associated. Everything which followed his lieutenancy of fifty years ago has contributed to the evolution of that ambitious scheme of naval reorganization upon which his title to fame will rest. The late emergence of colonial navies has given us a new imperial order suited to the new era into which we are moving. Sir John Fisher has been an imperialist from first to last. The last year or two have witnessed stupendous changes which have altered the whole basis of imperial strategy, and as First Sea Lord, strong in the confidence of either political party, Sir John has guided the naval developments till we find ourselves to-day in a strong position which, a dozen years ago, the keenest prophets could hardly have foreseen. The new Navy War Council and Naval Mobilization Department have put the coping-stone upon his achievements. —*United Service Gazette.*

There seems to be some danger that the new War Council may interfere with the initiative of officers commanding-in-chief afloat, and history has always shown that they are best left untroubled by anything other than such information as will enable them better to gauge the strength, position and intentions of the enemy. Improved means of communication have only strengthened the old principles; they should not be used as wires for the manipulation of marionettes. No doubt, however, this danger is securely guarded against, either in the constitution of the Council or in the good sense of the service. It is believed that the Council will prove to be an official medium through which responsible officers may interchange ideas on the conduct of possible campaigns, etc.—*United Service Magazine.*

Generally, it may be said, opinion in the service is entirely favorable to the creation of the War Council and other changes set forth in the Admiralty Memorandum. The establishment of a Mobilization Department on a higher footing, in accordance with the increased and increasing importance of its duties, is regarded as entirely satisfactory. As we said last week, the same department that draws up the war plans must see that their execution is made possible by an adequate provision of means for the purpose. There is still, however, a hankering in some quarters for an independent chief of the staff, a head of the strategy branch of the Admiralty who shall be co-equal with the First Sea Lord and chief naval adviser of the government. Let us see how this sort of thing works out in Germany. They endeavored there to create in regard to the navy a situation on the lines of that which in von Moltke's time worked very well for the army. Count von Baudissin was appointed Chief of the Admiral Staff, co-equal with Admiral von Tirpitz, the First Sea Lord. Things went very well for a time, and then the Chief of the Admiral Staff regarded it as his duty to point out to the Kaiser that the First Sea Lord's naval policy was not the policy he favored, and that the line Admiral Tirpitz was pursuing in regard to construction did not coincide with the war plans drawn up by the Admiral Staff, which required another means for their execution. The co-equality collapsed. Admiral von Tirpitz, the stronger man, prevailed, and von Baudissin was relegated to another sphere of work. We cannot help thinking that the draftsman of the arrangement at the Admiralty must have known of this circumstance when he made the Director of Mobilization subordinate to the First Sea Lord. It is possible, of course, that even under the present arrangement, with a weak First Sea Lord, the Director of Mobilization may have the power without the responsibility; while human nature is what it is such things may be. But the supreme head of the government, whether Prime Minister or Kaiser, cannot have two chief naval advisers or two naval advisers at all, unless the policy is to be a vacillating one with the ever-present possibility of a difference of opinion.—*Army and Navy Gazette.*

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Roma	12,625	Gov't Yard, Spezia.	Under trial.
Napoli	12,625	" " Naples.	" "
Dante-Alighieri	20,000	" " Castellamare.	Building.
Cavour	20,000	" " Spezia.	"
Michel-Angelo-Buonarotti	20,000	Leghorn (Orlando.)	Ordered.
Galileo-Galilei	20,000	Geneva (Odero.)	"
Armored Cruisers.			
San Giorgio	9,800	Gov't Yard, Castellamare.	Launched July 27, 1908.
San Marco	9,800	" "	" Dec. 22, 1908.
Pisa	9,800	Orlando Works.	Under trial.
Amalfi	9,800	Odero Works.	" "
B	9,800	Leghorn (Orlando.)	Building.

The four Italian battleships of the 1909 program have all been commenced, the places of construction being as follows: *Dante Alighieri*, Castellamare; *Cavour* (hitherto the *Leonardo da Vinci*), Spezia; *Galileo-Galilei*, Genoa; *Michel Angelo*, Livorne. It is stated that Signor Michelli, designer of the *Regina Margherita*, *Benedetto Brin*, and of the latest Italian armored cruisers, has been requested by the Minister of Marine to prepare plans for a battleship of 32,000 tons, armed with 16-inch guns.—*United Service Magazine.*

The *Moniteur de la Flotte* states that the first Italian *Dreadnoughts*, the *Dante-Alighieri* and *Cavour*, are to be armed with twelve 12-inch guns in four turrets and that their speed is to be 23 knots. Also that the contract price for the second pair, the *Michel Angelo* and *Galileo-Galilei*, indicates that their displacements have been increased to 23,000 tons, and that they are to be armed with eight 13.5-inch guns in four turrets.

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Satsuma	19,200	Yokosuka.	Launched Nov. 15, 1906.
Aki	19,800	Kure.	" Apr. 15, 1907
Kawachi	20,800	"	Building.
Settsu	20,800	Yokosuka.	"
Armored Cruisers.			
Ibuki	14,600	Kure.	Under trial.
Kurama	14,600	Yokosuka.	Launched Oct. 21, 1907.
Protected Cruisers.			
1	5,000	Sasebo.	Ordered.
2	5,000	Nagasaki.	"
3	5,000	Kobe.	"

The estimates for the coming year will contain no provision for the commencement of new armored ships. Two 5000-ton cruisers and a number of torpedo craft will, however, be laid down. There has been great delay in completing armored ships laid down in Japan, belying both the promise of the Tsukuba and the claim of the authorities to be able to complete a 20,000-ton ship within 24 months of the laying of the keel.—*United Service Magazine.*

TRIALS OF THE ARMORED CRUISER "IBUKI."—The Japanese armored cruiser *Ibuki* has recently completed a series of very successful steaming trials at the Kure Navy Yard in Japan. This vessel is equipped with Curtis marine reversible turbines, built by the Fore River Shipbuilding Company, Quincy, Mass., which were shipped to Japan and installed in the vessel at the Kure yard.

The turbines drive twin screws, and are of 12 feet pitch diameter, with seven stages. They were guaranteed to deliver 21,600 brake-horse-power. The table given below shows the results obtained on the various trials.

The contract guarantees were made on a basis of 250 pounds steam pressure and 28 inches vacuum at 200 revolutions for two-fifths power and 255 revolutions at full power. The actual trial conditions were somewhat under these, and the corrected water rates in the table are to allow for the differences.

The reversing power of the turbines was tested at the end of the four-fifths power run by running astern for fifteen minutes, keeping the same firing interval and conditions in the boiler-room as were used in going ahead. The turbines ran reversed at 186.3 revolutions, and developed 11,035 brake-horse-power. Also the general maneuvering qualities of the vessel were excellent.

The Fore River Shipbuilding Company have also supplied Curtis turbines for the battleship *Aki*, and Japanese yards are building Curtis turbines for two other battleships and three scout cruisers; two of the latter being ordered as a result of the successful outcome of the *Ibuki* trials.

Each of the turbines of the *Ibuki* has seven ahead wheels and two reverse wheels, all in one casing, and each in a compartment formed by diaphragms inside the casing. The first ahead-wheel and each of the reverse wheels has four rows of moving buckets, while the remaining wheels have three rows each. The steam leaving any wheel is directed through nozzles in the diaphragms onto the buckets of the next wheel. The turbines are reversed by simply shutting off steam from the ahead steam chest and opening the valve to the astern steam chest. The above turbines of the *Ibuki* are similar to those on the U. S. scout cruiser *Salem*, except that their pitch diameter is two feet greater than in those of the *Salem*.

TABULATED RESULTS OF OFFICIAL TRIALS OF THE "IBUKI."

	1/5 Power.	2/5 Power.	3/5 Power.	4/5 Power.	Full Power.
Duration of trial, hours.....	8	8	24	6	6
Steam chest pressure gage ...	221	228	230	240	230
Quality of steam.....	Sat.	Sat.	35° Sup.	28° Sup.	53° Sup.
Exhaust shell vacuum, inches.	28.1	27.5	27 2	26.4	25.7
Revolutions per minute.....	151.2	189.1	215.7	235.5	250.5
Brake-horse-power	5,077	10,077	15,730	20,978	27,142
Water per hour for main turbines, pounds.....	108,021	183,083	256,910	330,339	407,987
Water rate per brake-horse-power, pounds.....	21.27	18.17	16.35	15.73	15.03
Available British thermal units in steam.....	348.0	337.0	341.5	329.0	325.8
Efficiency of turbines, percent	34.3	41.6	45.5	49.2	52.0
Water rate corrected to contract conditions.....	....	16.75	....	....	13.88
Guaranteed water rate.....	....	17.0	....	....	15.0

—*International Marine Engineering.*

The trials of the *Ibuki*, according to *Le Yacht*, were extremely successful, and two battleships of the new program, as well as the three scouts under construction, will consequently be fitted with Curtis turbines. The *Ibuki* has not as yet installed any of her guns. The *Aki* is now having her

Curtis turbines installed; although launched in April, 1907, she will not be completed till 1911. The *Kurama* likewise is far from completion. The delays are partly due to lack of money and partly to the slow rate at which the Kure arsenal is turning out guns and mounts.

The scouts *Mogami* and *Yodo* have at last entered upon active service. The former, laid down in 1905, displaces 1329 tons, was designed to give 23 knots and developed a trial speed of 25 knots. The latter, also laid down in 1905, displaces only 1230 tons, and was designed to give 22.5 knots speed. They are armed with two 4.7-inch and four 3-inch guns, as well as two torpedo-tubes.

RUSSIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Emperor Paul I.	16,900	St. Petersburg.	Launched Sept. 7, 1907.
Andrei Pervozvannui	16,900	"	" Oct. 20, 1905.
Evstafi	12,500	Nicolaiev.	" Oct. 1906.
Ivan Zlatoust	12,500	Sevastopol.	" May 13, 1906.
Sevastopol	.....	St. Petersburg (Baltic Wks.).	Building.
Petropavlovsk	.....	" "	"
Poltava	.....	" (Admiralty Yd.).	"
Gangoot	.....	" " "	"
Armored Cruisers.			
Bayan	7,800	St. Petersburg.	Launched Aug. 15, 1907.
Pallada	7,800	"	" Nov. 10, 1906.
Protected Cruiser.			
Outchakoff	6,750	Sevastopol.	Building.

According to the *Moniteur de la Flotte*, the Russian naval budget amounts to 243,662,500 francs, of which 36,685,000 francs for the construction of new ships. The effective personnel will be 41,800 men.

UNITED STATES.

VESSELS BUILDING.

No.	Name.	Speed. Knots.	Where Building.	% of Completion Oct. 1.	% of Completion Nov. 1.
	Battleships.				
28	Delaware	21	Newport News.	96.8	97.4
29	North Dakota	21	Fore River.	95.2	96.6
30	Florida	20¾	Navy Yard, New York.	33.7	38.3
31	Utah	20¾	New York Shipbl'g Co.	44.2	50.0
32	Wyoming	20½	Wm. Cramp & Sons.	0	0
33	Arkansas	20½	N. Y. Shipbuilding Co.	0	1.0

The battleship *Delaware*, at the present time, with her sister ship, the *North Dakota*, the most powerful vessel afloat, exceeded her speed requirements on her screw standardization runs over the measured mile course in Penobscot Bay on October 23. She attained a speed of 21.563 knots, the contract speed required being 21 knots. The screw standardization tests began October 22, and included a dozen runs at slow speed. In the test on October 23 she was pushed to her limit. The weather conditions were favorable. Three runs were made at 19 knots, three at 20.50 knots and five at the maximum of 21.98 knots. The official figures follow: speed, 21.563; revolutions per minute, 128.38; indicated horse-power, main engines, 28,578; coal used per hour 53,945 pounds; water for all purposes, per I. H. P., main engines, 14.8 pounds; water per I. H. P., main engines only, 13.42 pounds; coal per I. H. P., main engines, all purposes, 1.887 pounds; coal per I. H. P., main engine and auxiliaries, estimated, 1.83 pounds.

A TRIUMPH FOR THE MARINE TURBINE.—While the battleship *North Dakota* has considerably exceeded its contract requirements, practical interest centers in the increased steaming radius made possible by the high efficiency of the Curtis turbines, with which it is equipped, rather than the fact that its maximum speed was 22.25 knots with a requirement of only 21 knots. With a coal consumption of only 105 tons per 24 hours, at the ordinary cruising speed of 12 knots, as compared with 111 tons burned on its sister ship, the *Delaware*, fitted with reciprocating engines, it is possible for the *North Dakota* to steam further without recoaling. Calculation from results of the trials shows that the *North Dakota's* steaming radius at 12-knot speed is 9000 knots, while at 19 knots it is 4600 knots, and at the maximum speed of 21½ knots per hour it is 3000 knots.

The results of the official trials are as follows:

	8 hours of full power.	24-hr. trial at 19 knots.	24-hr. trial at 12 knots.
Actual average speed	21.64	*19.24	12.05
Revolutions per minute	280.4	231.9	143.2
Shaft horse-power of main turbines	31,400	*16,710	3,800
Indicated horse-power of engine auxiliaries	1,100	*660	400
Water rate of main turbines only	13.6	14.11	20.5
Water rate for all engine purposes based on total horse-power	13.96	15.29	22.3
Coal used, pounds per hour	54,400	*27,550	9,820
Coal used, tons per 24 hours	583	295.3	105
Coal per hour per shaft horse-power of turbines	1.74	*1.65	2.58
Coal per hour per horse-power for total horse-power	1.68	*1.58	2.34
Coal per hour of equivalent I. H. P. based on 8 per cent friction for reciprocating engine	1.55	*1.46	2.15

* All preceding figures are official except those starred.

STANDARDIZATION TRIAL.

Highest speed on mile, uncorrected for tide, knots	22.5
Mean of five high runs, knots	21.83
Revolutions per minute for 21 knots	263
Revolutions per minute for 19 knots	228.8
Revolutions per minute for 12 knots	142.5
Maximum shaft horse-power developed on mile	35,150

—*Iron Age.*

The official trial trips of the *Delaware* and *North Dakota* included a new feature, to the results of which much service interest attaches. These are the two-hour oil-fuel runs, which terminated the official trial in the case of each ship. This made use of the liquid fuel stored in the double bottoms of the new battleships to the extent of about 600 tons, which is supposed to be equivalent to 900 tons of coal in its increase of the steaming radius of a vessel. The new battleships are designed with auxiliary equipment, which will permit the use of oil fuel in conjunction with coal. The storage of the oil in the double bottoms makes use of space, which would otherwise be unoccupied, so there is no difficulty in taking care of this material other than an increase of weight to be carried by a ship; when it is considered that the steaming radius is increased 30 per cent by this addition to the fuel supply, there is appreciation of the advantage of the acquisition.—*Army and Navy Journal.*

ORDNANCE AND GUNNERY. TORPEDOES.

THE CONTROL OF NAVAL GUNFIRE.—The experiments which have for so long a time been going on under the supervision of such officers as Admiral of the Fleet Sir A. K. Wilson, V. C., and Vice-Admiral Sir Percy Scott, among other experts, in the matter of controlling gun-fire on board ship, appear to have resulted in considerable improvement being attained. So much so that the number of masts which were originally needed in the *Dreadnought* type for carrying fire-control platforms will probably be reduced from the two carried by such ships as the *Superb* and *Bellerophon*, to one in ships of this and future years' building programs. Under any circumstance it is much better to control the gun-fire of the ship in some position where the controlling officer has the protection of armor, and is not likely to have his instruments and connections with the turrets and batteries destroyed by hostile shots. The reduction of the number of masts to carry control platforms in future ships goes to show that this problem is being solved, and that at no distant date light pole masts only will be required for wireless telegraphy purposes.

The prototype of the class was given one large and one small mast; but the *Dreadnought* is the only vessel of her class so rigged. All the later ships have been given two tripod masts, so that fire-control stations could be arranged to effectively control all the guns of the ship—for whatever purpose mounted. In future ships, however, it is almost certain that not more than one mast will be erected, and this will be used chiefly for wireless telegraphy purposes, although for the present it may also carry a control platform. Developments that have recently taken place in the control of gun fire, in what are known as the "all big gun" class of ships, tend to obviate the necessity of trusting all the eggs to one basket, and placing all the range-finding and range instruments on control platforms that may be brought down and rendered useless by one of the first shots fired in an action, and so throw fire-control into confusion during the early, and, therefore, the most important, phase of the fight. Means are now being found to control gun-fire much nearer the guns to be controlled than heretofore, and so many masts are not needed for this purpose. In fact, the ideal of having range-finding instruments, control officer and control gear, as well as the guns and men behind armor, affording the maximum amount of protection, is fast being approached.—*United Service Gazette.*

EXPERIMENTAL FIRING AT BALLOONS.—Some interesting rifle shooting experiments at captive balloons have recently been carried out. The first experiment took place at the rifle range, Jüterborg, near Berlin, against a small balloon some forty feet long, similar to those used for carrying the automatic apparatus employed for registering atmospheric variations. It is a pity, for the purposes of the experiment, that a car was not attached to it, in which dummy aeronauts could have been placed. The firing was first carried out by the depot company, and then by the machine gun instructional company of the Musketry School. The wind was sufficiently variable and strong enough to keep the balloon on the move, so that it offered a shifting target to the firers. The distance was 1250 yards, taken by the range-finder.

The depot company first fired in five minutes some 4800 rounds, the men firing sometimes on the knee, sometimes sitting. As the balloon continued to soar, the machine gun company took their turn at firing at it, firing 2700 rounds in two minutes and a half; but they were no more successful than the others in bringing it down. When it was brought to the ground it was seen that there were 76 hits in its envelope, although the holes made allowed very little gas to escape. It would seem, as the result of the ex-

periment, a gun alone, owing to the size of its projectile, will be able to destroy balloons.

Some further experiments were carried out in July at Darmstadt, the target being a captive balloon, 66 feet by 15, with a car attached, in which were placed two dummies representing aeronauts. The balloon, which floated at a height of between 400 and 500 yards, was fired at in succession by a company of infantry, a section of two machine guns and a light howitzer battery.

The company, at a range from about 1200 yards, fired 5000 rounds without apparent result; then the machine guns, at the same distance, fired 4000 rounds without bringing the balloon down; finally, the howitzer battery, placed at a distance of 2000 yards, smashed the balloon up in two rounds, which descended slowly, its empty torn envelope forming a parachute. Only one of the dummies was struck by a bullet and that was in the leg.

It is considered probable that had the balloon been stationary it might ultimately have been brought down, though still at an enormous expense of ammunition, and the circumstances would be more unfavorable were the balloons free. The German military authorities have, therefore, decided that infantry shall fire at a balloon only if it is near enough to enable them to hit the occupants of the car, and that the task of destroying the balloon itself or of rendering it incapable of proceeding shall be left to the artillery. —*United Service Institution.*

Great satisfaction appears to be felt in the French Navy at the new arrangement with regard to the gunnery ships and establishments. A rear-admiral will have command over the gunnery school for officers, the seamen-gunners' school, the ordnance investigation committee, and the gunnery training ships. Hitherto the relationship of these establishments has been loose and unsatisfactory, but now they will all be brought under a single chief, responsible directly to the Minister of Marine. It is hoped that considerable developments in naval gunnery will result. The change can be made at once, without increased outlay, owing to the suppression of the second division of cruisers in the Mediterranean under the redistribution scheme, the pay of the rear-admiral in command having been provided. The officer selected is Rear-Admiral Le Bris, who has obtained good results in the gunnery training ships, and will now have with his flag the *Tourville, Latouche-Tréville, Descartes, Pothuau* and the battleship *Masséna,* which is the training ship for seamen-gunners. It is expected that the new Minister will also reconstitute the division in the Far East, to consist of three armored cruisers of the *Dupleix* type.—*Army and Navy Gazette.*

THE FIRING AT THE "JÉNA."—According to *La Vie Maritime,* the tests of the famous P shell against the *Jéna* have proved that design of projectile (supposed to be a blunt-pointed, high-explosive shell intended to act against the underwater bodies of ships), to be exceedingly ineffective. The latest firings have been made with the 12-inch guns of the *Suffren* to determine the relative effects of three types of shell, the existing service A. P. shell and semi A. P. shell, and the new design of shell intended to be supplied to the *Danton* class. This latter type is an A. P. shell of 970 pounds total weight, carrying a high explosive charge of about 29 pounds, and designed to penetrate thick armor before bursting.

One result of these experiments has been to demonstrate the utter absurdity of the idea that the crews of ships can be decimated by asphyxiation by the fumes of high explosive shell. Dogs, rabbits and pigeons placed on the *Jéna* suffered no harm unless they were hit by fragments of the exploding shell.

MARINE TURBINES AND GAS ENGINES.

LIQUID FUEL.

A MARINE STEAM TURBINE REDUCING GEAR.—It is fundamental that any motor running at slow speed must be larger than one of equivalent power running at a higher speed. Steam turbines are naturally adapted to run at very high speeds, and many forms of apparatus, such as generators, pumps, blowers, etc., intended to be directly connected to steam turbines, have been brought out in special forms capable of operation at high speeds. The propulsion of vessels by steam turbines has been a problem not so easily solved, as there is a limit to the speed of the screws. Consequently where turbines have been applied to vessels it has been necessary to make them larger than was desirable simply that they might have slow enough rotative speeds to be directly connected to the screws. Attacking this problem from another standpoint, Rear-Admiral George W. Melville, U. S. N., retired; J. H. McAlpine, formerly of the navy, and George Westinghouse have been working together upon a reducing gear to be interposed between a marine turbine and the screw to make it possible to use smaller turbines running at higher speeds.

The first model of this reducing gear has recently been completed at the shops of the Westinghouse Machine Company at East Pittsburg, Pa. The details of its construction have not yet been announced, but it is claimed that with the use of this reducing gear it will be possible to use turbines of lighter weight than were formerly placed in vessels, and it is understood that it will make it possible not only to greatly reduce the weight of the power plant in very large transatlantic steamships and battleships, but also to very materially decrease the expense of their construction.—*Iron Age.*

THE DEVELOPMENT OF THE GAS ENGINE.—It has been said that difficulties only occur to the engineer to be overcome, a remark which, though savoring somewhat of hyperbole, may be generally accepted, with the reservation that the process is often slow and tedious. This is especially so when principles are not completely understood, and progress has become to a great extent a matter of trial and error, or, if you will, rule of thumb. It is always interesting, and sometimes profitable, to trace the development and endeavor to forecast the future of some particular branch of engineering by a process analogous to plotting and extending a curve. In the case of the gas engine the development has been remarkable, though probably not so rapid as seemed at one time probable. What have been and what are the obstacles to progress? Before answering this question it is necessary to remark that for small powers, the upper limit of which it is not easy to define, but which may be taken as between 300 and 500 horse-power, the gas engine as a simple, reliable and economical prime mover holds the field. This is a general statement, and, like all such, must be qualified, the exceptions being those special cases, such as marine propulsion, where the successful application depends much more on perfection of detail than on any questions of principle. In these cases sufficient pioneer work has not yet been done, though there can be little doubt of the ultimate result.

Leaving the small gas engine, and considering the larger powers, we find that, as in all other engineering problems, it has two aspects, the technical and the financial or commercial, and these cannot be entirely separated, for it is obvious that a first condition to be realized before an industry can develop is that the article manufactured can be sold at a profit, while, on the other hand, it is also necessary that after being sold it shall, as the result of knowledge and forethought in design and manufacture, continue to give satisfaction in the hands of the user. It is necessary to touch briefly

on the financial aspect of the question, because some of the hindrance has been due to causes of this nature. It is known that some makers have held back from making the larger size gas engines, not because they feared the engineering difficulties, but because they were not convinced that there was any money in it. It would seem at first strange that there should be one law for the small gas engine and another for the large. Every species of manufactured article has its own particular law of cost which follows directly from the engineering conditions or requirements. In a steam installation, for example, the engineering conditions say that for a given power the cylinders, shafts, etc., must be of a certain size, the boiler must have a certain amount of heating surface and so on, all of which determine the amount of material to be employed and the amount of labor to be spent upon it, and hence are determining factors in the ultimate cost. As we proceed from one size to another, we find, as we should expect, that the total cost varies in no simple manner, being made up as it is of a large number of separate items, each varying in its own particular way. The cost of different sizes can, however, as a rule, be plotted on a curve, and such curves are very useful and instructive when applied to the manufacture of a number of articles of the same species, but of different size, and they show graphically what we have called the law of cost. If plotted with horse-power as abscissæ and cost per horse-power as ordinates, the law for most prime movers shows the general characteristic that the cost per horse-power diminishes as the horse-power rises. This characteristic will be most marked where the engines, motors or whatever the prime mover may be, are all of identical type, consisting of the same number of parts, differing only in dimensions, where, in short, the small may be considered as a model of the large. In the case of steam machinery, for example, whether reciprocating or turbine, we can pass from a small size to a large without any change in the general features of the design; but this is not the case with the gas engine, where beyond a certain diameter of cylinder the engineering requirements which follow from the nigh temperatures and thickness of metal demand special consideration and a radical change in design. Up to a certain power the single-acting cylinder with unjacketed piston and ordinary mushroom valves quite meets the case, but above this size the exhaust valve and piston must be water-jacketed. At this point we should find a discontinuity in the curve of cost which will rise suddenly due to these additions. The increase, moreover, will be greater than would at first sight appear, for the addition of the water jacket to the piston involves heavier reciprocating weight, a slower speed of revolution, and, therefore, a larger engine. Proceeding upwards in power, we arrive at a point where, owing to increase of diameter of the cylinder, it becomes desirable either to make the engine double-acting or sub divide the power in two cylinders. Either alternative means additional cost for the double-acting cylinder means a water-cooled piston-rod, external guides and other working parts again adding to the reciprocating weights with a further reduction of speed of revolution. The latter alternative involves duplication of parts with increased cost of machining, fitting and erecting. In the larger sizes also it is generally deemed advisable to fit more elaborate and costly mechanism for working the valves. Other factors have contributed to make the large gas engine a rather costly thing to produce, and this disadvantage has weighed against it except in cases where the fuel is to be had for nothing, as in the waste gases for blast furnaces, though even here some engineers favor the burning of the gases under a boiler and using the steam in a turbine. The advance made in steam turbine construction and economy of recent years has undoubtedly to some extent hindered the growth of the large gas engine. Turning to the purely engineering side of the question, the problem of extending the gas engine to larger units

resolves itself largely into the consideration of the stresses set up by the high temperature in the cylinder and in the avoidance of pre-ignition. The large gas engines which have been run successfully in this country and on the continent using blast furnace and similar waste gases are a class to themselves, and, so far, have not been greatly employed with gases of higher calorific value. It is the engines using mainly producer gas to which we now refer. No difficulty is to be feared in the mechanical problems to be solved, it is only the thermal conditions which cause anxiety, and though experience is daily accumulating, it is mostly a record of effects the causes of which are as yet imperfectly understood.

In a recent paper Professor Hopkinson showed what the temperatures were in an uncooled piston, and calculated the magnitude of the stresses set up. It is common knowledge that the troubles due to unequal expansion are more often met in the water-jacketed ends, and these are frequently of such complex construction that even if the difference of temperature on the two sides of the metal were accurately known, it would be quite impossible to calculate the stress. It is known, however, that the stresses increase rapidly as the size of cylinder and thickness of metal is increased, and the general direction in which this difficulty is being met is in the avoidance of extraneous causes which would tend to facilitate fracture, and in the use of stronger material, such as cast steel in lieu of cast iron. The most common of the extraneous causes is "casting stress," and it is now the almost universal practice to simplify the cylinder-end casting as much as possible, and avoid tying the parts to one another by rigid connections. Probably sufficient attention has not yet been directed to the use of cast steel. The stronger material enables the thickness of the walls to be reduced for a given diameter of cylinder; the temperature difference is reduced, and the stresses due to unequal expansion reduced also. It will be noted that in the inner surface of the wall of a cylinder end the stresses due to the pressure in the cylinder, and the expansion due to temperature, are both compressive, and the real stress is their sum. Making the wall thinner will increase the stress due to the pressure, but diminish the stress due to temperature, because the temperature difference has been reduced. This point is sometimes lost sight of, and accounts for the fact that an increase of thickness has often failed to cure fractures of cylinder ends. There appears to be a tendency at the present time towards the engine with several cylinders, so as to keep the unit below the line where expansion troubles commence, the multiplication of parts being accepted as the lesser evil. Moreover, the engine with several cylinders has advantages in some cases where even turning moment and higher speeds of revolution are desired. How far this movement will spread remains to be seen, but it appears a good interim policy pending further experience with the larger sized cylinders.—*The Engineer.*

OIL FUEL IN THE BRITISH NAVY.—It is now known that the Admiralty have decided to return to the use of liquid fuel for destroyers, and the vessels recently ordered will probably all be fitted for its use. Why there should have been the sudden suspension of oil fuel and then a return to it after a brief interval is not very obvious, but is probably not unconnected with the oil market, which is subject to more or less violent fluctuations. Presumably satisfactory contracts have been entered into for some years ahead, and the stores in the large Admiralty tanks must now be accumulating, as a good number of the tanks are already complete. In view of the fact that results have been obtained with oil fuel which could not be approached with coal, it is a matter for congratulation that the Admiralty have seen their way to return to its use.—*The Engineer.*

MISCELLANEOUS.

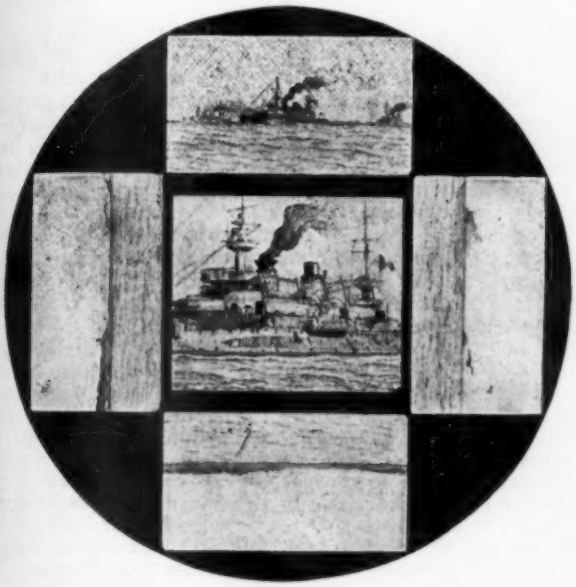
NEW PERISCOPE LENSE.—The accompanying illustration shows a lense which has been made and designed by Messrs. Aldis Brothers, the makers of the well-known Aldis photographic lenses, for the Improved Periscope, Ltd. The results attained by this remarkable lense are so apparent from the illustration, and the extremely important part played by the periscope as the "eye" of the submarine is so self-evident, that little or no description is called for. The fundamental feature of the invention, which has

only recently been patented, is that it gives the observer a continuous vision, taking in the whole of the horizon. It is thought that this lense will be of eneromous assistance to the look-out man. The invention and manufacture are entirely British. It is, as above indicated, one of the products of the optical works of Messrs. Aldis Brothers, and our attention was drawn to it by an article on the works which recently appeared in *The Amateur Photographer and Photographic News*. The other illustration shows an older form of arrangement for the periscope.—*Page's Weekly*.

LIFE-SAVING APPLIANCES FOR SUBMARINES.—The life-saving helmet appliance with which it is intended to equipt all submarines of the British Navy, consists of a short tunic of water-proof material, to which is united

a helmet containing cartridges of a certain chemical substance, which, in the presence of water vapor of the breath, gives off pure oxygen, and takes up the carbon dioxide of the expired air. In this respect the apparatus is similar to certain forms of self-contained smoke helmets for use in mines. As adapted for submarines the helmet and jacket complete weigh only sixteen pounds. For use in conjunction with the helmet a submarine is fitted with a pair of steel curtains or screens, one on either side of the hull, pendant from the shell plating of the main compartment. These screens are closed at either end, and extend to within about three feet six inches of the deck of the boat, thus forming air traps in the event of the hull becoming flooded with water.

Within these traps, which are open at the bottom, are suspended helmets for each one of the crew; each helmet is arranged with the dress tucked up



inside it, and, if by any mishap the hold is flooded with members of the crew below, or the air becomes charged with chlorine gas, those in danger can get under the steel screens and stand up with their heads and shoulders in the air trap and out of reach of the water. The putting on of the helmet and jacket is a matter of a few moments, the appliance being dropped over the head and the arms inserted. The tap admitting air to the oxygen-producing cartridge is then opened, and a supply of oxygen sufficient for half-an-hour or more is ensured. If the accident has resulted in the formation of poisonous fumes of chlorine gas, the apparatus enables the wearers to escape to the conning towers with safety or, perhaps, to rectify defects in the machinery.

On the other hand, if, as possibly may have been the case of *C11*, a collision results in the sinking of the boat with the conning-tower open, the unfortunate man below rushes to the temporary shelter of the trap, and, having donned the helmet, gets under the screen, and finds his way as best he can to the open hatchway, and quickly floats to the surface. In com-

paratively shallow water, as, for instance, up to twenty fathoms, the ascent to the surface, when once the man is clear of the boat, presents no difficulties, and the dress itself acts as a lifebuoy which will enable the wearer to float without difficulty so long as the supply of oxygen holds out. In deep water the physiological dangers attending a too rapid ascent have to be faced. Even when the conning-tower's hatch happens to be closed, it can be opened from within the sunken boat as soon as the hold is flooded to a sufficient degree to equalize the hydrostatic pressure within and without. There is another set of conditions in which the helmet may be used with good prospects of success. In the case of the boat becoming disabled when submerged and refusing to rise to the surface, the crew are able to don their helmets, and then deliberately to flood the compartment, when the hatchway can be opened, and the way of escape to the surface provided.—*United Service Gazette.*

WIRELESS INSTITUTE MEETING.—At a meeting of the Wireless Institute, held in the Engineering Societies Building, New York, on October 6, a paper having the title "Proportioning Transmitter to Aerial" was presented by Mr. F. W. Midgeley. The author reported the results of experimental observations to show the ratio between the natural wave-length of the aerial circuit and the length of the aerial itself. This ratio has a value varying from below 4 to above 5, being greater for a straight vertical wire and less for a wire turned back upon itself or having a horizontal section. A good average value for the ratio is 4.4.

It is evident that for the most effective transmission the signals should be propagated at a wave-length corresponding to the natural wave-length of the aerial or 4.4 times the length of the aerial. This relation fixes at once the desirable transmission frequency. Since in any resonating circuit the frequency is $f = 1 \div 2\pi \sqrt{LC}$, the product of L and C—that is, of the inductance and capacity—is set by the length of the aerial. The aerial itself possesses a certain amount of inductance, which may be considered the minimum permissible value for L, indicating thereby a certain maximum value for C. Now, with a certain value of capacity there is a definite length of spark-gap for best operation, and for each length of spark-gap there is required a definite voltage. A definite voltage at a definite frequency impressed across a condenser of a certain capacity requires a definite amount of volt-amperes. In this manner it was shown that for each arrangement of aerial there is a best value for the input power, which value increases with the increase in wave-length, and in many cases is much less than the value actually employed with the wave-length selected for transmission.—*Electrical World.*

LOCATING VESSELS BY WIRELESS TELEGRAPHY.—*To the Editors of Electrical World:* Sirs—We have read the very interesting letters published in your issues of April 23, May 13 and 27, July 22 and August 12 on the subject of the locating of vessels by wireless telegraphy. The letters indicate, however, that the use of our radiogoniometer for determining the position of a transmiting station is evidently not sufficiently well known, and there appears also to be some misconception as to the case of application of the method on board ship. For this reason we think that some information on the subject may prove of interest to the readers of the *Electrical World.*

For ship installations we employ only two equal and mutually perpendicular directive aerials, each one composed of two antennæ convergent at the upper ends and joined at the lower ends by a conductor, in circuit with which latter is the corresponding winding of the radiogoniometer. Each directive aerial makes an angle of 45° with the longitudinal axis of the ship, and owing to this arrangement the antennæ do not form any incum-

brance on the vessel, since they follow the line of the shrouds. In addition to the directive aerials, an ordinary vertical antenna is connected to the radiogoniometer.

The detector connected to the radiogoniometer can be of any known type—that is to say, a telephonic apparatus, a coherer, a reflecting galvanometer or even the Gáti barretter.

The direction of a transmitting station is obtained by determining the two limiting positions of the movable coil of the radiogoniometer where the reception vanishes and by bisecting the angle formed by these two positions. By taking several pairs of readings, an approximation of 1° is readily obtained. The whole operation takes but a very brief time, as an ordinary wireless operator can make 10 pairs of observations in one minute, which number is more than sufficient to obtain the bearing of the transmitting station to the above approximation.

The chief advantage over all other methods, which depend mainly on quantitative measurements, consists in the fact that the direction is determined from the ordinary signals constituting messages, no special signals of long duration or at a low speed being necessary. By simultaneously employing the directive aerials and the vertical antenna one can determine both the direction and the sense in which the radiation arrives with respect to the position of the ship. The receiving arrangement usually employed makes use of telephonic reception; but if aural reception is disturbed by extraneous noises, the same results are obtainable if any other of the types of receiving apparatus mentioned above is employed.

One very important property of the radiogoniometric method of determining the direction of a transmitting station is that this determination is made instantly and independently of the course being followed by the vessel, while with all other methods the ship is obliged to make several attempts before it is possible to know if it is approaching or receding from the transmitting station. This property represents a saving of precious time and it is consequently evident that by the radiogoniometric method it is possible to bring, with the greatest rapidity and the least delay, the assistance demanded by a ship in distress. It is illusory to suppose that if a vessel in distress succeeds in signaling its position it is certain that the rescuing vessels will be able to find her easily. As a matter of fact, the ship, being generally at the mercy of the waves, the wind and the current, will have drifted from her original position while awaiting succor, and, therefore, the rescuing vessels, after having reached the spot signaled them, will have to search, for hours perhaps, for the ship in distress. It is hence indispensable that the rescuing vessels should have at their command a system for locating the position of any ship which is sending signals; and the radiogoniometric method is the one which lends itself best to the attainment of this object.

Besides the use of the radiogoniometer for determining the direction of a ship in distress, we might call attention to the value of the same method for enabling one to avoid collisions in time of fog. For this purpose vessels fitted with wireless equipments have only to send signals from time to time during such atmospheric conditions, and then if such vessels are fitted with a radiogoniometer, each vessels can determine whether or not any of the others is on her course.

Another use of the radiogoniometer is in connection with making port, which in foggy weather is always dangerous. But if there is a wireless station in action in the neighborhood, a ship fitted with the radiogoniometer can, by taking the bearing of this station and regulating her movements thereby, make a landing with the greatest certainty, in the same manner as in clear weather, by taking the bearing of a light or other visible signal. The radiogoniometer in this way becomes a Hertzian "standard compass."
—E. BELLINI AND A. TOSI, *in Electrical World.*

THE KRUPP-GERMANIA SUBMERSIBLES.—Submarine boats are divided into two species, submarines and submersibles, of which, however, the former will shortly disappear, leaving the field open to the type that experience has proved to be the better. The submersible has the following advantages:

1. It is possible to give the boat lines resembling those of an ordinary ship, thus securing a better surface speed.

2. The fuel being placed between the two hulls it is possible to carry more fuel and to increase the radius of action. For instance, the first 200-ton *Germania* submersibles had a radius of action of 1100 miles against 300 miles for the English *A* submarines of the Holland-type of similar displacement.

3. The vision is better as, due to the high freeboard of the submersibles, it is possible to steer from the deck, in weather that obliges the submarine to close all her ports and to steer by means of the periscope. The freeboard of the submarine is necessarily reduced, as otherwise the quantity of water-ballast to be taken in for diving would become too great.

4. The favorable lines of the submersible increase her surface stability and improve her sea-going qualities. This circumstance assumes a high importance as the speed increases, the form of the submarine being adverse to high speeds.

5. The habitability of the submersible is better, as more space is available in the inner hull, the fuel tanks and water ballasts being placed externally, and the high freeboard permitting of staying on deck, even in a rough sea.

6. In case of accidents the submersible offers greater safety, as in case of a collision the outer hull would stand the shock. Moreover, when the submersible cannot rise to the surface by her ordinary means, the blowing out of the ballast tanks will cause a reduction of weight from 20 to 30 per cent, while in a submarine it would decrease only by 10 to 15 per cent.

7. Finally it is possible to provide the submersible with a more powerful armament, as part of the torpedo-tubes can be located in the outer hull.

The Germania Shipyards, Fried. Krupp A. G., at Kiel, are the only private German yard building submersibles.

The qualities of the Krupp-Germania submersible have been highly appreciated by all experts that have studied it and the orders given by the German and foreign governments are a proof of the favor in which it is held.

The list of Krupp-Germania submersibles, built or building comprises:

Five boats for the German Navy.

Four boats for the Russian Navy.

Two boats for the Austro-Hungarian Navy.

One boat for the Norwegian Navy.

The success of the Krupp-Germania submersibles is due to the following causes:

1. The judicious choice of the form of the vessel, both suitable for surface navigation and propulsion under water.

2. The form of the inner hull, which is of circular section, the only one, the resistance of which can be exactly calculated and that gives the assurance that no deformation of the hull will take place even at great depth.

3. The distribution of the liquid fuel-tanks according to patents owned by the Germania Shipyards. These tanks are located outside the inner hull, the liquid fuel being absolutely prevented from penetrating into the interior of the boat.

4. The use of ordinary kerosene oil of a specific density higher than 0.8, even for the starting of the motors, excluding absolutely petrol, gasoline and similar substances, the danger of which has been demonstrated by frequent accidents.

5. The use of a special system of accumulators combining great capacity with absolutely safety, short circuits never occurring.

6. Rapid diving on an even keel.
7. Easy maintenance of the required depth.
8. Solid construction of all parts.
9. Powerful armament.

The submersible ordered by Norway will undertake her trials in autumn, 1909.

The two boats for the Austro-Hungarian Navy have been handed over to the Austrian Admiralty. They were completed at Kiel, but as the reception trials had to take place in Austria, they were transferred from Kiel to Pola, a distance of over 3500 miles. These voyages, during which heavy weather was encountered, have proved again the excellent sea-going qualities of the Krupp-Germania submersibles as well as their habitability.

The following description of these Austrian boats (by L. Persius in *Schiffbau*, November 14, 1909) will be of interest, especially because the submersibles being supplied to the German Navy are of the same type.

The dimensions are as follows:

Length over all	43.20 m.
Beam	3.75 m.
Draft	2.95 m.
Greatest diameter of inner hull	3.05 m.
Displacement on the surface	237 t.
Displacement when submerged	300 t.

The torpedo armament comprises two bowtubes and three Whitehead torpedoes of 18 inches diameter.

For surface navigation the boats are propelled by kerosene motors, while electric motors are used under water. The former aggregate 600 horsepower and the latter 320, giving the boat a speed of 12 knots on the surface and 8.6 knots under water. The radius of action under water amounts to 60 miles at a speed of six knots, while for surface navigation it is 1400 miles at speed of 10 knots.

The boats have twin screws. Each shaft is worked by one electric motor ane one kerosene motor. The screws have three blades; the position of the blades can be altered by a mechanism worked from the interior of the boat; the screws are, therefore, reversible. When the boat is not running at the maximum speed on the surface, the surplus output of the kerosene motors can be used for charging the accumulators. The kerosene is carried in tanks which are situated, according to a patent owned by the Germaniawerft, outside the inner hull, in order to prevent explosions. The weight of the kerosene used by the motors is automatically balanced by sea-water, admitted into the tanks.

The submerging and emerging is partly effected by filling and emptying the outer and inner ballast tanks and partly by two pairs of horizontal diving rudders. When the boat is running on the surface with her kerosene motors, the time necessary for bringing the boat in the position ready for diving amounts to six minutes. When ready for diving, she may be submerged within 15 seconds. The arrangement for ventilation is very carefully designed. When running at the surface, the air is taken from the interior of the boat to which it is conducted through two vertical ventilating tubes, which, when diving, are put down in horizontal position on deck. When traveling under water the heated air is conducted through the ventilators from the engine-room throughout the boat, purified and dried in various apparatus and then, being cooled, returns to the engine-room. The boat may remain 24 hours under water. The complement comprises two officers and 15 petty officers and men.

The inner hull consists of nine circular-welded sections, connected by inner fish-plates. The three sections amidships are cylindrical, the rest being conical. In order to take big engine parts and their accessories out of the boat, in case of necessary repairs, flanged couplings of the sections

are provided in two places, the boat may thus be taken apart in three divisions.

All scantlings are of such proportions as to enable the hull to stand safely the water-pressure at a depth of 50 meters. The tightness of the seams of the inner hull is tested by a pressure of six atmospheres.

The inner hull is arranged as follows: at the after end are placed part of the storage batteries. Then comes the engine-room, with two kerosene motors and two main electromotors and several auxiliary electric engines. Ahead of the engine-room is the room for the inner ballast, which serves to compensate for variations in the specific weight of the water and to regulate the buoyancy, when the boat is submerged. This compartment further contains the stearing-gear for the diving rudders, placed just below the conning-tower and connected with the latter by means of a voice-pipe. With this apparatus both pairs of diving rudders may be worked simultaneously by one man. The diving rudders are fore and aft on both sides, while the vertical rudder, the larger part of which is located below and the smaller one above the deck, is located abaft.

The officers accommodation, comprising two berths, and the crew-quarters, consisting of eight berths, are situated further ahead, and are separated by a small electrically operated galley and a W. C. Airtightly separated from the quarters and below leck the main part of the accumulator-battery is situated. The bow end contains the torpedo-room with two torpedo-tubes, the store for the reserve torpedo and the apparatus for handling the torpedoes. The latter are introduced into the interior of the boat through a hatch abaft the conning-tower. In the armored conning-tower, situated amiships, are arranged the commanding appliances and the two periscopes, the manometer, the commanding gear and the rudder. The dimensions of the tower are such as to accommodate three men. The periscopes are worked by means of an electric motor and turned by hand. The arc of vision in vertical and horizontal direction amounts to 50°, and the periscope-tubes of nearly 5 meters length allow a perfectly free arc of vision and admit navigation in such depth as to protect the boat from gun fire. The conning-tower has watertight openings into the inner hull and forms the sole access to the interior. The armour of the tower suffices for resisting the attack of small caliber gun-shots. Abaft the tower is situated a conning platform, intended for surface navigation at moderate sea. The shape of the tower is designed with a view to minimize the resistance of water when traveling under water.

This outer hull surrounds the inner hull, giving the boat a suitable shape for good sea-going qualities and containing amidships water-ballast tanks. Fore and aft of the latter are situated the tanks for the kerosene which closely fit the shape of the boat. The outside hull is a particularity of the boat. The walls of this hull need not stand any pressure, being, contrary to the inner hull, not exposed to water-pressure when traveling under water.

As to the engine plant, the two reversible propellers are, at surface navigation, driven by two 2-cycle kerosene motors, aggregating 600 horse-power, and at underwater navigation by two electric motors of the double-collector-shunt type with alternating pole, developing 320 horse-power. The battery consists of watt-cells filled with peat and is installed in the two airtight compartments mentioned above.

The auxiliary machinery comprises: two main and one auxiliary motor-driven bilge-pumps, two hand-worked bilge-pumps for pumping bilge and ballast water, one high-pressure and one low-pressure air compressor for generating the compressed air used for ballast and torpedo purposes, two electrically operated ventilators, one windlass which may be hand-worked as well as motor-driven, and one motor-pump for trimming.

For salving purposes a safety-weight is attached to the keel. The weight can be loosed by means of a handle. By detaching this safety-keel, the

weight of the craft can be lessened by five tons. This arrangement is deemed a successful safeguard against all possible accidents. Moreover, the ballast-tanks can be emptied by means of compressed air within very short time. In case the boat has gone to the bottom various arrangements have been provided for, to raise her quickly and to prevent loss of life. To the inner hull strong hocks are fastened with short strops, to which hawsers can be coupled. The vitiated air in the interior of the boat can be purified by special apparatus. Moreover, installations are provided for by which the interior of the boat may be supplied with fresh air from the atmosphere.

On the conning-platform abaft the conning-tower is placed a buoy which can be unfastened from the inside of the hull, then rises to the surface, thus admitting, being fitted with a telephone and a light buoy, to communicate with the crew and marking the spot of the accident.

NEW BRITISH SCOUTING CRUISERS.—The Admiralty critics have taken exception time and again to what they regard as the unjustifiable delay in the building of light cruisers to checkmate the corresponding vessels of continental powers. Germany, for instance, has for some time been laying down, with unhesitating regularity, two such vessels per annum, and with these they have, as is well known, been making exhaustive comparative trials of various systems of propelling machinery, a practice which they still continue. They have completed since 1907, or are now building, 13 modern cruisers, ranging in displacement from 3200 tons to 4230 tons, and in designed speed from 23 to 25 knots, while for armament they have twelve 4-inch guns and eight machine-guns, and depend for protection on a protective deck. Such vessels are the eyes of a fleet, and many have been anxious as to whether the relative position in the German and British fleets was being maintained satisfactorily in respect of security, or in the speed with which knowledge of the position of an enemy could be communicated to the officers and commander of the squadron. There was the disquieting fact that, with the exception of the eight scouts, which are not comparable in respect of size or gun-power with the German vessels, although of 25 knots speed, we had only four cruising vessels of more than 21 knots. About two years ago, however, the Admiralty recognized that the psychological moment had arrived for the strengthening of our fleet in this type of ship, and laid down the first of practically a new class in the *Boadicea*, which has just been completed, and exceeded a speed of 25 knots on her trials. Following this came the *Bellona*, a sister ship. Both these vessels are 385 feet in length, 41 feet in beam, 13½ feet draft and displace 3300 tons, and with Yarrow boilers and Parsons turbines develop 18,000 horse-power. It was felt, however, that the armament of only six guns of 4-inch caliber was insufficient for effective reconnaissance work, and last year there were laid down five vessels, which were given the names of cities traditional in the British Navy. The first of these new "city" cruisers was launched September 30, and the others will follow at short intervals during the next two months. The difference in the dates of launch is largely due to the varying practice of the contractors; owing to the minute subdivision of machinery compartments, some of the firms are placing the boilers, or parts of the machinery, on board before the launch, in order that the bulkheads may be riveted and water-tested before the vessels are afloat. The Admiralty are now adjudicating upon the tenders for four more of these "city" cruisers, and Pembroke is making progress with the building of two more *Boadiceas*. Within two years, therefore, we shall have laid down thirteen high-speed cruisers, all of which will exceed 25 knots in speed. This goes some way to make up any deficiency which may exist in this type of cruiser.

Provided the tactical efficiency of the fleet has not been jeopardized at any time by the absence of these high-speed scouting cruisers—and as to

this we have had the assurance of the Committee of Defence of the Cabinet —the Admiralty are to be commended, because delay has brought distinct advantages, particularly in the evolving of a satisfactory system of propelling machinery and armament. The machinery of these vessels is, undoubtedly, a most important element in the design, as high speed and its maintenance at sea with a high degree of economy, to ensure a wide radius of action, are outstanding desiderata in effective scouting. The efficient use of oil fuel, without the issue of smoke from the funnels, the capacity for sudden increase in power which the water-tube boiler gives, and the facility with which acceleration in speed and the safety with which overloading can be resorted to with the turbines, confer enormous advantages. In regard to weight, too, the turbine machinery has simplified the problem of the naval constructor. In the earlier cruisers with reciprocating engines, the steam consumption was rarely under 18 pounds per indicated horse-power per hour, and then under forced-draft conditions. In the new vessels the guaranteed steam consumption is only 13 pounds, and in the case of the cruiser which is being fitted with the Curtis turbine, using steam with a slight degree of superheat, the guarantee is stated to be 12½ pounds. As a consequence of this, there is an appreciable reduction in the boiler power required to maintain full speed. All the "city" cruisers have twelve boilers, with a collective heating surface approximating 50,000 square feet, and a grate area of close upon 900 square feet, a ratio of practically 55 to 1. The machinery for the new ships, it is understood, will only slightly exceed 1000 tons in weight, so that 22 horse-power is being developed per ton, and that, too, without resorting to a high degree of forced draft. In the scouts the weight of boilers and reciprocating machinery was reduced to a minimum, and the power per ton in earlier high-speed cruisers rarely over 20 indicated horse-power, even when the machinery was severely pressed. The assumption is, therefore, justified that the power and speed of the new vessels will be attained with a greater degree of reliability. Indeed, the modern type of warship involves only a fraction of the anxiety which weighs upon the engineer responsible for long steaming at high speeds in ships with reciprocating engines, however well they may have been designed.

The *Bristol*, as is now known, is being fitted with Curtis turbines by Messrs. John Brown & Co., and it is not improbable that this system will also be applied to one or more of the four vessels soon to be ordered. One of the 20 destroyers just ordered is also to be fitted with this installation, which enables twin-screws to be fitted. There is just a possibility, too, that in another of the new cruisers the Parsons system will be adapted for twin-screw propulsion. It is likely also that the Parsons new partial-flow reaction turbine will be applied. The other vessels will have the normal Parsons reaction turbine system, the high-pressure end being extended to improve economy at cruising speeds. With the combined impulse and reaction turbines and the normal Parsons system four shafts will be used. The arrangements of engine-rooms afford a striking example of the convenience in subdivision, which was referred to at some length in a recent article on the choice of number of propellers. There will be three longitudinal bulkheads in each engine-room, the shafts driving the two inside propellers being in the central compartment, and the turbines working the outer propellers in the outer starboard and port compartments. Each shaft will have one ahead turbine, the two on the port side being in series, and the two on the starboard side similarly treated for steam-distribution purposes. There will be two separate astern turbines on the shafts, having the high-pressure ahead turbines, while the low-pressure ahead turbines will, as usual, incorporate the astern turbines. The condensers will be placed abaft in two separate compartments divided by a center-line bulkhead. The Curtis arrangement admits of each shaft having turbines constituting a separate unit, and there will only be two

engine-rooms divided by a center-line bulkhead, as in all twin-screw cruisers. The engine-rooms, as well as the boiler-rooms, will have the protection afforded by coal-bunkers, as well as by heavy protective decks.

For their size these cruisers are more heavily armed than preceding ships. The earlier vessels were 450 feet in length, 47 feet in beam and at 15 feet 3 inches displaced 4800 tons. The ships soon to be ordered will, it is understood, be of the same length, but of 48 feet beam, and with this slightly increased beam will displace over 5000 tons. They will have powerful 6-inch bow and stern chasing guns, and in addition ten 4-inch guns. These are undoubtedly more effective weapons than those placed in the preceding ships, and the number of machine-guns will also be increased. Their speed is to be 26 knots, but looking to past experience it is likely that this will be exceeded. The later German vessels to which we have already referred are 388 feet long and of 46 feet beam, displacing about 4250 tons. Their speed is 25½ knots, but they are only fitted with twelve and fourteen guns corresponding to our 4-inch guns. The new "city" class thus marks a distinct advance in every respect, and notably in radius of action. Their cost, too, cannot be regarded as excessive, as they promise to work out at not much more than £300,000 each, ready for service.—*Engineering.*

THE STREAM LINE THEORY AND COLLISIONS AT SEA.—There would at first appear to be very little connection, if any, between stream lines and collisions, but a curious and exceptional paper is in front of us, which shows that under certain conditions the nature of the reactions on moving vessels in close proximity may make it much more difficult to avoid a collision than one would suppose. The paper is called "Some Model Experiments on Suction of Vessels," and its author is Naval Constructor D. W. Taylor, of the United States Navy, who is well known for his work in connection with the resistance of ships and researches in the screw propeller problem.

The paper gives the result of some investigations made at the experimental tank on the mutual reactions on models of vessels moving side by side at different distances apart and when passing one another, and as it is a subject which has hitherto received little attention, the paper is of considerable interest. The models were all 20 feet in length, and from the other dimensions given would appear to be of battleship proportions. The speed at which they were timed was from 2 to 3 knots, and the corresponding speed for a vessel 490 feet in length would, therefore, be 9¾ to 14½ knots. The models had a displacement "in fresh water"—but why drag in the fresh water?—of 3000 pounds, so that the displacement of the full-sized ship of the above length would be about 19,000 tons. In the general result it was found that the mutual action between the models varied with the speed, as the resistance of the models and the forces measured are indicated on the diagrams in terms of the resistance. The forces were measured at points near the bow and stern, and it is stated that the results cannot be regarded as highly accurate, owing to the difficulty in towing the models exactly straight, but they show the general tendency very clearly. When towed abreast about one-fifth the length of the models apart, representing about 33 yards in our full-sized ship, there is an attraction between the two varying from 1.2 times the resistance at the bow to 2.2 times at the stern. As one would suppose, this attraction reduces rapidly as the distance between the vessels is increased. At one-quarter the length apart, say 40 yards, for the full-sized ship, the attraction diminishes to two-thirds the resistance at the bow to a force equal to the resistance at the stern, and so on, until when the distance has increased to half the length of the vessel or more, the suction has almost entirely disappeared. When one vessel is overtaking another there is a change in the direction and magnitude of the forces, beginning with a repulsion which is greater at the stern than at the bow of the overtaking vessel. When the bow of the overtaking vessels is abreast of the overtaken, the force at the bow changes

to one of attraction, but the repulsion at the stern has increased in magnitude. From this point onward the attraction at the bow increases rapidly, while the repulsion at the stern diminishes rapidly, and eventually changes again, so that both forces at bow and stern become attractive. This continues until the vessels are abreast, after which the forces undergo changes in reverse order as the overtaking vessel passes the overtaken. It is pointed out that the existence of these forces makes the avoidance of collisions difficult after certain positions have been reached. There is a strong course acting on the overtaking ship tending to swing its bow in towards the overtaken ship which it would be probably impossible to counteract entirely by putting the helms over, and it is also pointed out that the magnitude of the forces would also be greater in shallow water, such as the fairway of a river, where these conditions are of practical importance owing to the nearness with which it is often necessary for vessels to pass one another. The general results could have been predicted from the application of the stream line theory, although it would not be possible to evaluate the magnitude of the forces. We know that if the particles in a stream line are diverted, there is no resultant pressure so long as the particles return to their original direction with their original velocity, for in that case there is no permanent change of momentum. In the case of two vessels close together abreast, the momentum of the water flowing between them is reduced to a greater extent than that of the water flowing outside them, and the result is a pressure on each tending to force them together. Everybody has probably seen this phenomena exemplified in the tendency of boats to drift together in a tideway. The case of vessels approaching one another in parallel lines is more complex, but the direction of the resilient forces can been seen by drawing the stream lines round the two vessels. The magnitude of the forces appears greater than one would suppose to be the case, and as the figures given in the paper make no great claim to accuracy, the subject may well receive further experimental investigation.

The practical application of the results may not be great. No seaman wants to pass another vessel within a distance less than half the length of his ship if he can possibly avoid it, neither does he require to be told that in a narrow channel in close proximity to other vessels, reduced speed is essential to safety. On the other hand, if the magnitude of the forces are as great as found in these experiments, some light may be thrown on such cases as the *Gladiator* and *St. Paul* collision, for the conclusion to be drawn from the results given in Naval Constructor Taylor's paper is that once a certain relative position between two vessels has been reached, it is impossible to avoid a collision unless the way on both vessels is instantly checked.—*The Engineer.*

ELECTRIC PROPULSION OF NAVAL VESSELS.—Two applications of electricity to propulsion of naval vessels were described in a paper presented by Mr. W. L. R. Emmet at a meeting of the Society of Naval Architects and Marine Engineers held in New York on November 17 and 18. The applications were designated as the "combination drive" and the "electric drive" respectively. In the former, use is made of both electric motors and low-pressure steam turbines for driving the propeller shafts, while in the latter the propulsion is wholly by electric motors. The first of these plans has been made the subject of a proposition to the Government for one of the new battleships, the turbine part being designed by the Fore River Shipbuilding Company and the electrical part by the General Electric Company. The second plan has been applied on a small scale to two fireboats in Chicago, and is being elaborated for application to war vessels.

In the combination drive it is proposed to use twin screws and to mount upon each propeller shaft a low-pressure turbine and an electric motor. The motor would receive energy from a generator driven by a high-pressure turbine which would exhaust through the low-pressure turbine.

The adjustments would be so made that at full speed the motor would deliver two-fifths and the low-pressure turbine three-fifths of the power taken by the propeller shafts. At low speeds the low-pressure turbine would carry no load. The motors would be of the two-speed squirrel-cage induction type without provision for reversal; the low-pressure turbine would be fitted with two reversing stages similar to those that would be adopted with direct turbine drive.

In the complete electric drive, as applied specifically to naval vessels, it is proposed to mount on each propeller shaft two motors, one of which would be arranged with pole-changing switches so as to adapt it to use at lower speeds, this motor being similar in construction and performance to that proposed with the combination drive. The other motor would have only a small number of poles for use at high speeds, but would be of the wound-rotor type adapted to producing the high torque desirable in rapid changes of the ship's direction.

The author stated that the electric speed change involves no kind of complication, difficulty or uncertainty. The efficiency of the electric speed-reducing arrangement was said to be 92 per cent, which is higher than any other arrangement that can be used for the same service.

The results of calculations are given showing that with the electric drive there would be a reduction in the machinery weight from 520 tons for the steam turbine drive to 354 tons; a decrease in the steam consumption from 25.6 pounds to 17.8 pounds per hourly horse-power; and with the same boiler equipment, an increase in cruising range from 4700 to 7600 miles at 12-knot speed, or in maximum speed from 20.5 to 21.2 knots.—*Electrical World.*

BOOK NOTICES.

"Le Prix du Sang." By Commander Sémenoff. Translation into French, by Commandant de Balincourt. Published by the Librarie Maritime et Coloniale, A. Challamel, Editor, 17 Rue Jacob, Paris. 3 fr. 50, postpaid.

This is the fourth and final volume purporting to be taken from Commander Sémenoff's memorandum book of observations made during the Russo-Japanese War. While exaggerated and somewhat hysterical, this volume, equally with its predecessors, is interesting and well worth reading by students of the military art, as well as by those interested in the study of human nature.

The author's carping criticism of his Japanese captors and his ingratitude for their kind treatment are painful, especially in view of grave doubts as to how Japanese prisoners would have been treated in Russia, if the conditions had been reversed: they will be understood, however, by those who are under the strong influence of race antipathy.

Commander Balincourt supplies an introduction.

P. R. A.

"Ralph Osborn—Midshipman at Annapolis," Lieut.-Commander Beach's latest story, is written with marked ingenuity; and, of course, with full mastery of materials. Mr. Beach's own course at Annapolis, and the insight and maturity he gained as an officer on duty several times in different departments of the institution, make the story in pre-eminent degree authentic and useful. Mr. Beach knows the life at Annapolis from the midshipman's point of view, and from that of the officer; and as well as producing a most readable story he has furnished the boys of the country with a little cyclopedia of the Naval Academy whose variety of information they can classify according to their own sweet wills. Ralph Osborn, the hero, has a hard time of it; his sky is frequently full of blackest clouds; and while his character is as sound as oak or Harveyized steel his reputation is several times so close to the rocks that it seems quite impossible to save it. An evil genius pursued him almost from the time he came to Annapolis as a candidate until the day he clutched his diploma and got his first real taste of heaven. No doubt midshipmen have graduated who have been followed by some brother of Nemesis as persistently as Ralph was followed by Mr. Thomas G. Short, the vengeance that dogged his footsteps during four long years. We are glad, however, that such examples are rare; and that the youth at Annapolis ordinarily experience only that kind of pursuit, which, while it frequently makes them decidedly apprehensive and uncomfortable, is essential to their renovation and discipline. The

chapter entitled "The Osborn Demonstration" ought to be intellectually quickening to all aspirants to the Naval Academy. In an entirely original way Ralph proves that the square of the hypothenuse of a right-angled triangle is equal to the squares of the two other sides. There have been midshipmen prodigies in mathematics, and Ralph Osborn was one of them. This feat of Ralph's might be made an allegory of naval progress, always constructing something new both in theory and fact from the premises of the old. Such a book as "Ralph Osborn" is useful in another way: it resuscitates words and phrases belonging to the old navy with which all would soon be over but for the timely appearance of such stories. Seamanship, one of the oldest of the arts, is soonest forgotten in nomenclature as well as practice. The story of Ralph Osborn is thrilling as well as technically correct and interesting. We wish it a Merry Christmas!

W. A. Wilde & Co., Boston, Mass. Price, —.

H. H. C.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. F. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CUILIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886.

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888.

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891.

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892.

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894.

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895.

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

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The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-sixth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fee to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life-members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

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Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The Proceedings are published quarterly, and may be obtained by non-members upon application to the Secretary and Treasurer at Annapolis, Md. Inventors of articles connected with the naval profession will be afforded an opportunity of exhibiting and explaining their inventions. A description of such inventions as may be deemed by the Board of Control of use to the service will be published in the Proceedings.

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A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1910. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention, may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

PHILIP R. ALGER,
Professor, U. S. N., Secretary and Treasurer

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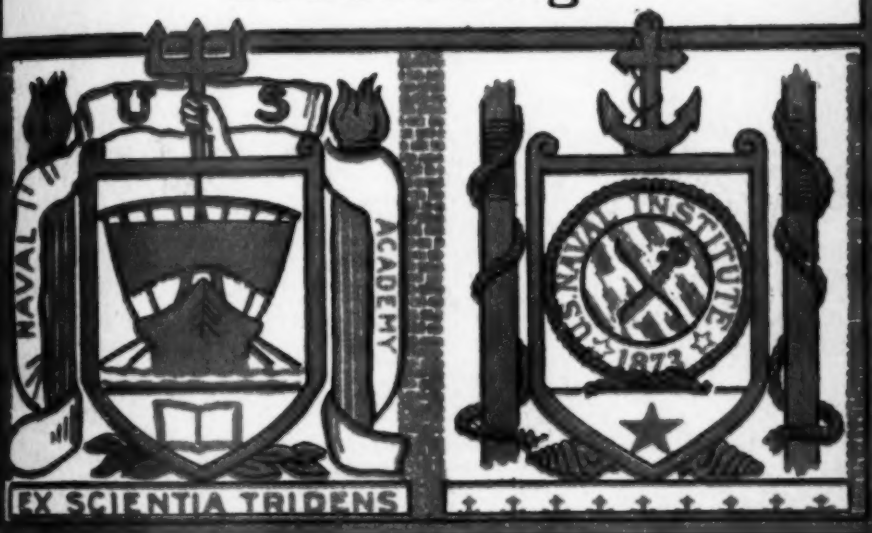

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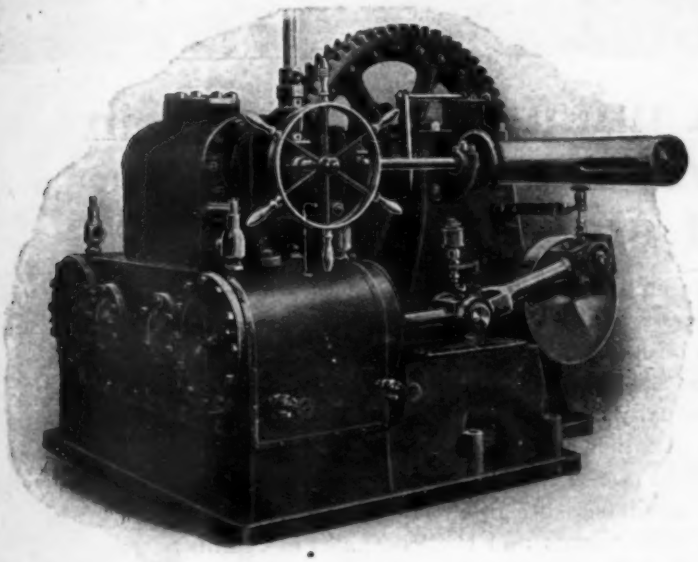

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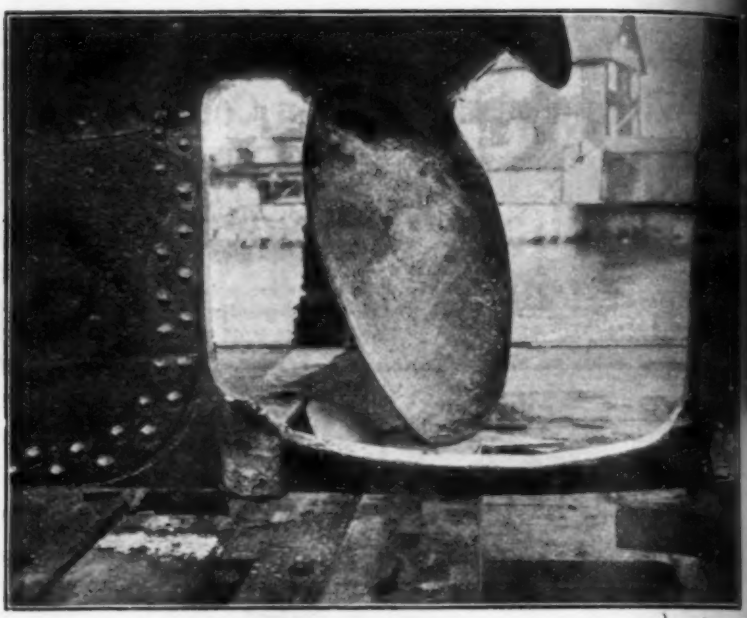

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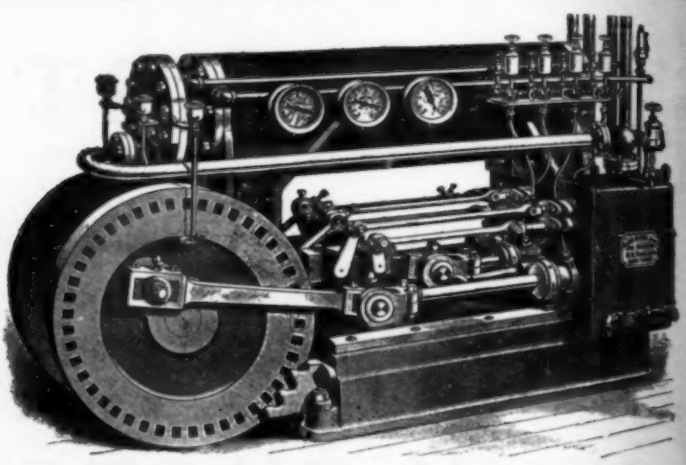

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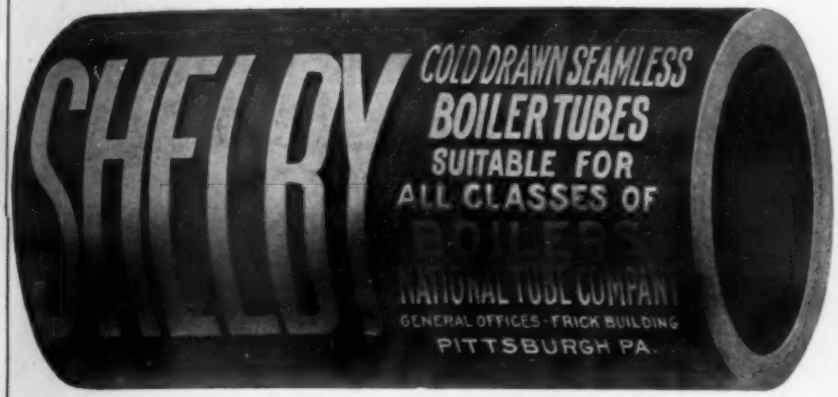

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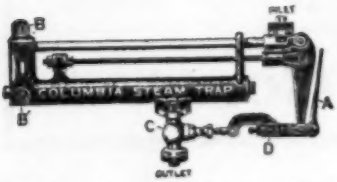

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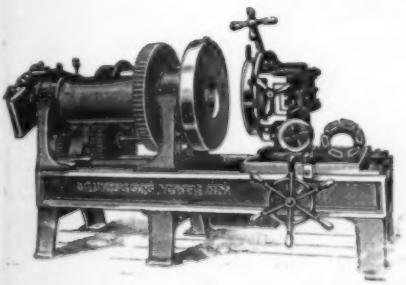

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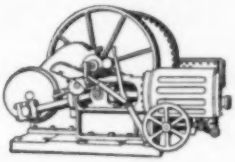

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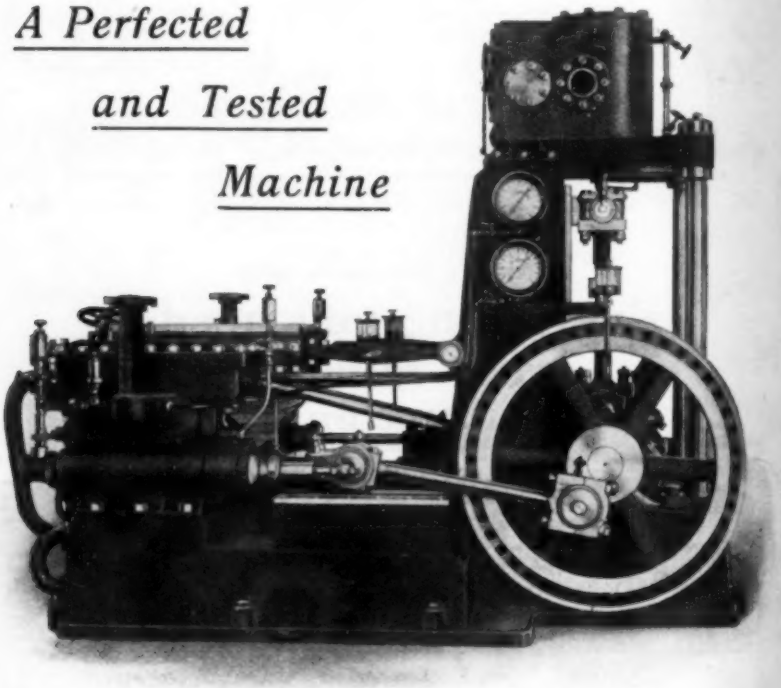

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